DOCUMENT RESUME

ED 158 740 IR 006 297

TITLE	Communication in the Service of American Health...A Bicentennial Report from the National Library of Medicine.
INSTITUTION	National Library of Medicine (DHEW), Bethesda, Md.
SPONS AGENCY	National Institutes of Health (DHEW), Bethesda, Md.
REPORT NO	DHEW-NIH-76-256
PUB DATE	76
NOTE	99p.
EDRS PRICE	MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS	Audiovisual Aids; *Data Bases; Health Education; History; Indexing; *Information Networks; *Library Services; Medical Education; *Medical Libraries; On Line Systems

ABSTRACT

Programs of the National Library of Medicine over almost a century and a half are described, ranging from a history of American medical literature and the development of medical indexing to modern technological developments. Activities covered include the development of the Toxicology Information Program and the online data base TOXLINE; the traditional library services which are now modernized through CATLINE (Cataloging-On-Line), MEDLINE, SERLINE, and DOCLINE (Document Delivery On-Line); the responsibilities of the History of Medicine Division, a collection of pre-1870 manuscripts, prints, and photographs; the extramaural programs of the library, including health sciences library construction, the Regional Medical Library system, research grants, training programs, and publications; acquisition of non-U.S. biomedical literature and relationships with institutions abroad; the services of the National Audiovisual Center including AVLINE (Audiovisuals On-Line); new technological applications such as biomedical communication, computer based education, and computer research and development; and the administrative structure of the library. (JAB)

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COMMUNICATION IN THE SERVICE OF AMERICAN HEALTH... A BICENTENNIAL REPORT FROM THE NATIONAL LIBRARY OF MEDICINE

IR006297

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE • Public Health Service • National Institutes of Health

Bethesda, Maryland 1976

DHEW Publication No. (NIH) 76-256

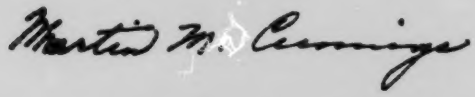
PREFACE

There are relatively few institutions that can claim to have witnessed two-thirds of our nation's history. Founded only 60 years after the birth of our country (1836) the National Library of Medicine has been intimately involved with both Federal and private health programs as a major collector and distributor of health related information. It is my hope that those in the health community, for whom this report is intended, will come to realize what an irreplaceable treasure they possess in their National Library of Medicine.

Not only has the Library been a regular contributor to the medical literature (having issued some 10 million copies of *Index Medicus* since 1879), but it has been a moving force in developing new modalities for information dissemination. This amalgamation of traditional functions and services with new technology is a theme the reader will encounter over and over in each chapter.

In honor of the Bicentennial celebration the Library will have a special exhibit on American medical literature. On display will be early treasures from our collection including a letter from George Washington recommending two doctors to the Medical Department of the Army. The exhibit will be open throughout 1976, and I invite those interested in the nation's medical history to visit the Library and view it.

Finally, I wish to acknowledge that whatever greatness the Library has achieved throughout its history is not because of a physical collection of texts and journals, but the result of vision and effort on the part of a dedicated and loyal staff. American medicine can indeed be proud of their accomplishments.



Martin M. Cummings, M.D.
Director
National Library of Medicine
Bethesda, Maryland

CONTENTS

List of tables 5
Directors of the Library 6
Officers of the Library 7
Historical chronology 8

I. **A Brief History of the American Medical Literature, 1776-1976**
Martin M. Cummings, M.D. 10

II. **From Fasciculus to On-Line Terminal: One Hundred Years of Medical Indexing**
1876-1960, *Scott Adams* 14
The Growth Years 16
The Lean Years 18
The Renaissance Years 19
The Age of Automation 21
1960 to Present, *Davis B. McCarn* 21

III. **Meeting the Need for Toxicological Information,** *Henry M. Kissman, Ph.D.* 26
Development of the Program 27
Creation of a Query Response Capability 28
The Development of On-Line Retrieval Services for Toxicology 29
A Toxicology Data Retrieval System 30
Interagency Toxicology Information Activities 30

IV. **Classical Services, Modern Modes,** *Joseph Leiter, Ph.D.* 32
Technical Services 35
Bibliographic Services 36
Medical Subject Headings 38
Reference Services 38

V. **A Library within the Library—The History of Medicine Collections**
John B. Blake, Ph.D. 44
Manuscripts and Oral History 47
Prints and Photographs Collections 49
Publications 49

VI. **Outside Our Walls—The Extramural Programs,** *Ernest M. Allen, Sc.D.* 52
Construction 54
Resource and Service Improvement 54
Regional Medical Libraries 55
Research and Demonstration 57
Training 58
Special Scientific Projects 58
Publications 59

VII. **A National Resource with Global Impact,** *Mary E. Corning* 62
MEDLARS Cooperation 64
Exchange Programs 67
AID Services 67
Public Law 480 Programs 68
Foreign Visitors 69
National Biomedical Information Centers 70
Regional Programs for Biomedical Information 71
International Organizations 71

CONTENTS

VIII. **Not by Print Alone—Audiovisual Services for Health Science Education**
George E. Mitchell, D.M.D. 72
Clearinghouse 74
Educational Research and Evaluation 75
Acquisition and Distribution 75
Workshops and Conferences 75
Advisory Services 76
Media Development 76
New Technology and Future Directions 76

IX. **New Technology, New Applications—Innovation in Health Communication**
Robert M. Bird, M.D. 78
Broadband Biomedical Communications 79
Computer Based Education 83
Computer Technology Research and Development 85
Continuing Postgraduate Education for Physicians 85
Focal Point Role for the Lister Hill Center 86

X. **Administering a Space-Age Communications Resource, *Kent A. Smith*** 88
Board of Regents 89
Financial Resources 91
Staffing 92
Awards and Honors 93
Lister Hill Center Building 93
Copyright 95
Exhibits 95
Equal Employment Opportunity Activities 95

Appendix 1. Staff Bibliography 97
Appendix 2. PL-480 Supported Publications 98

LIST OF TABLES

Table 1. Percentage distribution of on-line use by type of requestor 25

Table 2. Percentage distribution by purpose of search 25

Table 3. Source of requests to Toxicology Information Response Center 28

Table 4. Growth of collections 41

Table 5. Summary of acquisition statistics 41

Table 6. Summary of cataloging activities 41

Table 7. Binding statistics 42

Table 8. Summary of bibliographic services 42

Table 9. Summary of on-line services 42

Table 10. Summary of circulation activities 43

Table 11. Summary of reference services 43

Table 12. History of medicine activities 50

Table 13. Medical Library Assistance Act history 60

Table 14. Grant awards, 1966-1975 61

Table 15. Grant awards, FY 1975 61

Table 16. Non-U.S. MEDLARS Centers 66

Table 17. Types of P.L. 480 projects active in FY 1975 66

Table 18. Amounts obligated, FY 1972-FY 1976 91

Table 19. Financial resources and allocations, FY 1975 91

Table 20. Personnel ceilings 92

DIRECTORS OF THE LIBRARY

1865-1895 Col. John S. Billings

1896-1897 Col. David L. Huntington

1898-1902 Maj. James C. Merrill

1902 Maj. Walter Reed

1903-1904 Brig. Gen. Calvin DeWitt

1904-1913 Brig. Gen. Walter D. McCaw

1913-1918 Col. Champe C. McCulloch

1918-1919 Brig. Gen. Francis A. Winter

1919 Col. Paul F. Straub

1919-1924 Maj. Gen. Robert E. Noble

1924-1927 Col. James M. Phalen

1927-1932 Col. Percy M. Ashburn

1932-1936 Maj. Edgar E. Hume

1936-1944 Col. Harold W. Jones

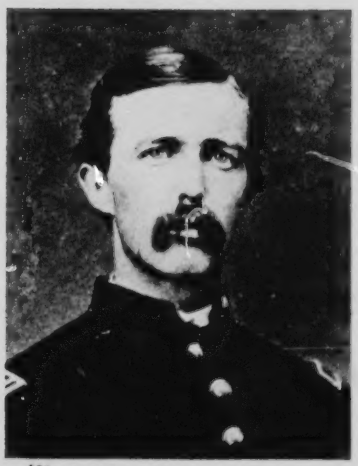
1945-1946 Col. L.L. Gardner

1946-1949 Col. Joseph H. McNinch

1949-1963 Col. Frank B. Rogers

1964- Dr. Martin M. Cummings

John Shaw Billings (1838-1913)



OFFICERS OF THE LIBRARY

Director	Martin M. Cummings, M.D.
Deputy Director	Melvin S. Day
Assistant Deputy Director	Harold M. Schoolman, M.D.
Assistant Director for Educational Resources Development	Charles F. Bridgman, Ph.D.
Assistant Director for International Programs	Mary E. Corning
Assistant Director for Administration	Kent A. Smith
Associate Director for Library Operations	Joseph Leiter, Ph.D.
Associate Director for Extramural Programs	Ernest M. Allen, Sc.D.
Associate Director for Computer and Communications Systems	Davis B. McCarn
Associate Director for Specialized Information Services	Henry M. Kissman, Ph.D.
Director, Lister Hill National Center for Biomedical Communications	Robert M. Bird, M.D.
Director, National Medical Audiovisual Center	George E. Mitchell, D.M.D.

HISTORICAL CHRONOLOGY OF THE NATIONAL LIBRARY OF MEDICINE

The Library has been located in (from left): Riggs Bank Building, Ford's Theater, and the Army Medical Library and Museum. Present facility is on facing page.

1836 Origin of the Library of the Surgeon General's Office with collection of books in the office of the Army Surgeon General, Joseph Lovell.

1840 First listing of books in Library: *A Catalogue of Books in the Library of the Surgeon-General's Office.*

1865 John Shaw Billings, M.D., assumes charge of the collection.

1866 Library moves to Ford's Theater.

1879 First issue of *Index Medicus.*

1880 Publication of Volume I of the *Index-Catalogue of the Library of the Surgeon General's Office.*

1887 Library moves to newly constructed brick building on the Washington Mall.

1922 The Library of the Surgeon General's Office becomes the Army Medical Library.

1937 Microfilming operation begins at the Library.

1942 Photoduplication service incorporated into library operations.

1948 Preliminary edition of *Army Medical Library Classification* (now *NLM Classification*) issued.

1950 Library issues its first annual catalog: *Army Medical Library Catalog,* 1949.

1952 Army Medical Library becomes Armed Forces Medical Library.

1956 Armed Forces Medical Library becomes National Library of Medicine as the result of legislation sponsored by Senators Lister Hill and John F. Kennedy.

1962 Library moves to its new seven million dollar building on the campus of the National Institutes of Health in Bethesda.

1964 MEDLARS (computerized data base) becomes operational and is used to produce the *Index Medicus* (January 1964).

1965 Medical Library Assistance Act signed [illegible]

1967 Regional [illegible] Program

1968 NLM [illegible] Institutes of [illegible]

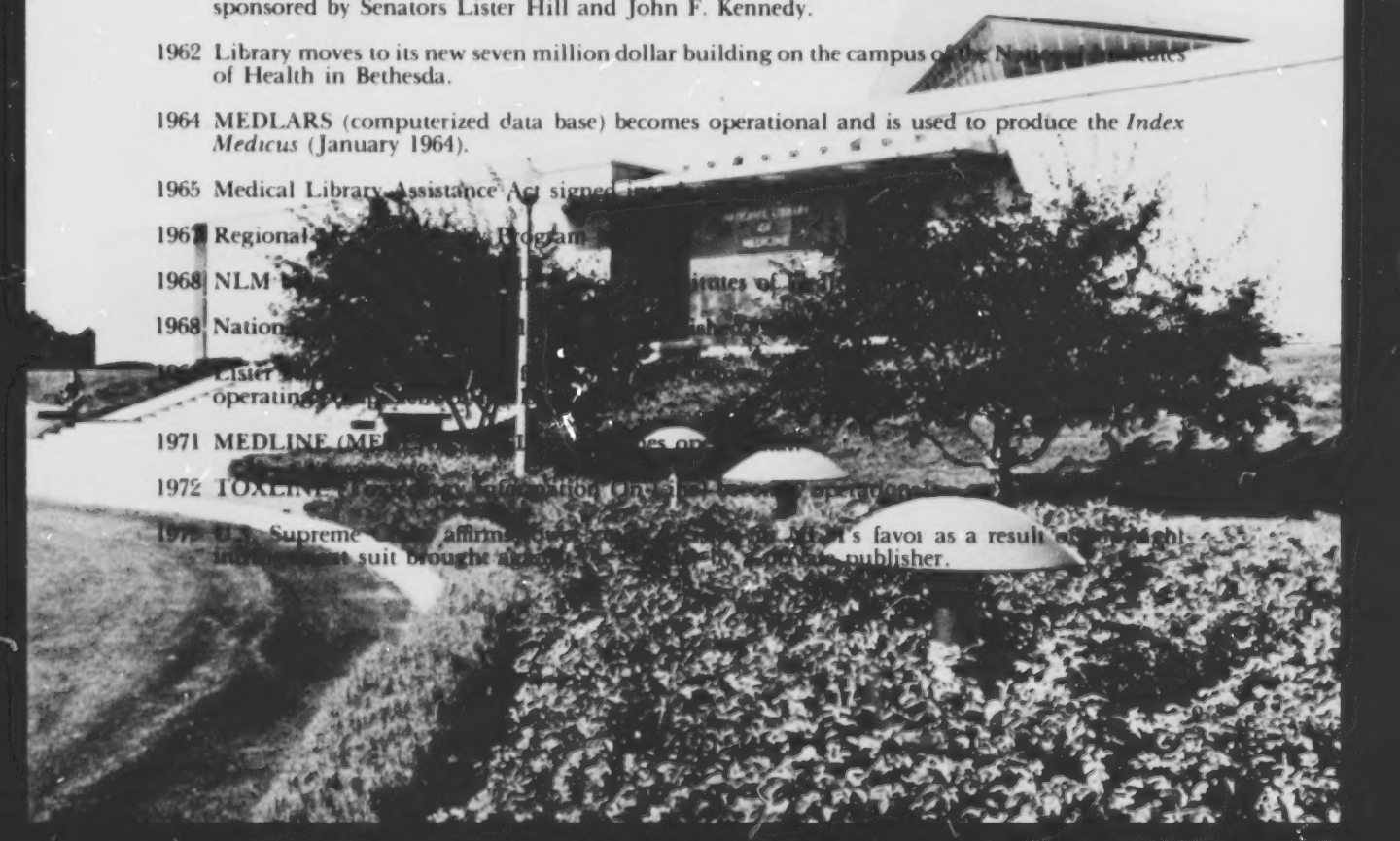
1968 Nation[illegible]

[illegible] Lister [illegible] operating [illegible]

1971 MEDLINE (ME[illegible] [illegible]es on-[illegible]

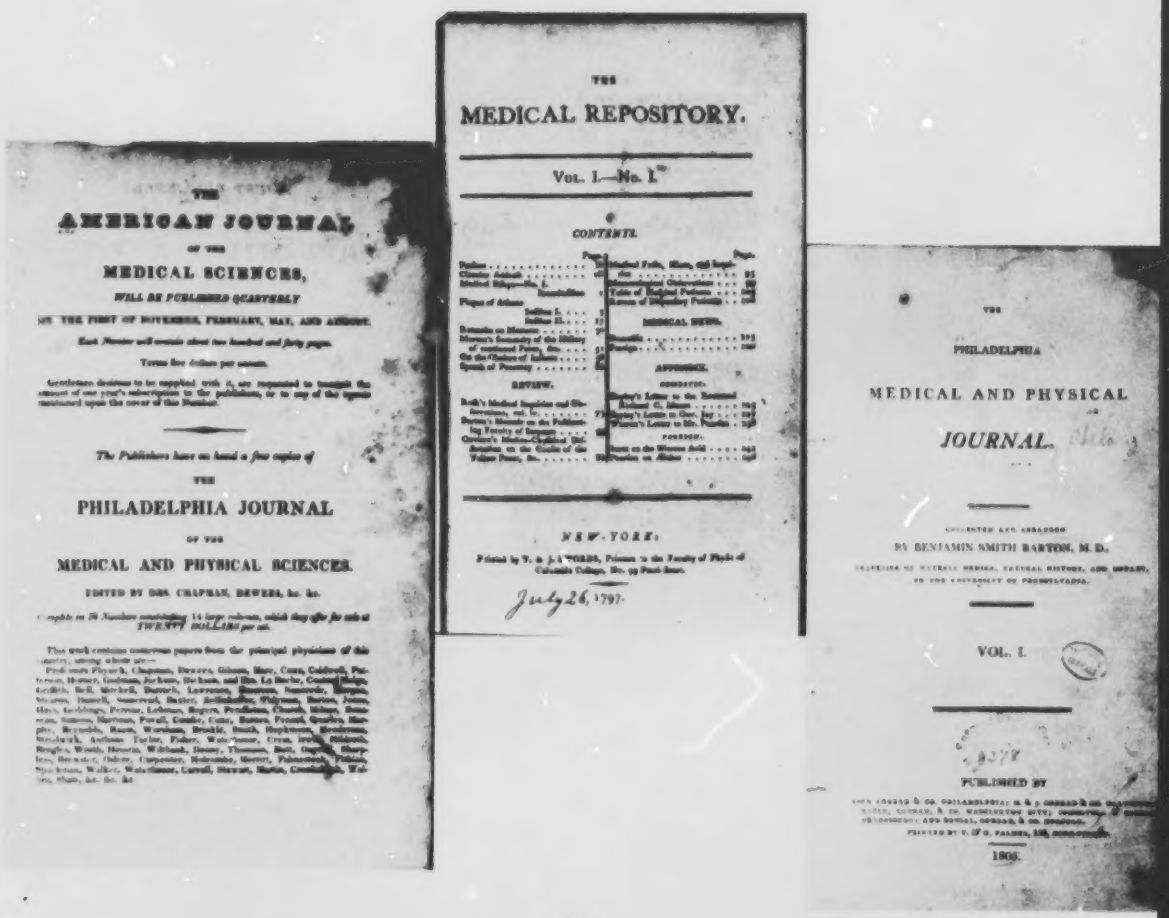
1972 TOXLINE [illegible] Information [illegible] operational

1973 U.S. Supreme [illegible] affirms [illegible] NLM's favor as a result of [illegible] infringement suit brought against [illegible] by a private publisher.



CHAPTER I A BRIEF HISTORY OF THE AMERICAN MEDICAL LITERATURE 1776–1976

Martin M. Cummings, M.D., Director



On the occasion of the American Bicentennial, it is fitting that we who are concerned with biomedical communication look back to survey the proud tradition of American medical literature. Before the American Revolution, many publications dealing with health came from the pens of clergymen and explorers. To Thomas Thacher, an ordained New England minister, belongs the credit for the first medical publication written and printed in what is now the United States. His "A Brief Rule to guide the Common People of New-England How to order themselves and theirs in the Small Pocks, or Measels," appeared in 1678. This was soon followed by the publications of Rev. Dr. Cotton Mather and his friend, Dr. Zabdiel Boylston, who first advocated and introduced in America the practice of inoculation against smallpox.

12

Prior to 1776 American medicine was based almost exclusively on ideas, practices, and publications imported from Europe. American medical culture generated little scientific publication and meager communication other than by word of mouth or letter. For that matter, there were few discoveries or inventions to be reported. Most public health matters were dealt with in the public press. Medical library facilities were commensurate with the state of the literature. Although there were a few private collections, it was not until 1763 that the first real American medical library came into existence at the Pennsylvania Hospital.

As in Europe, where the first scientific journals were published by learned societies, the American scientific literature was an outgrowth of the emerging scientific organizations. Their proceedings soon dominated the field of scientific publishing. One of these organizations, the American Philosophical Society founded in 1743, was the first to use a committee as an editorial review mechanism in the selection of manuscripts for publication. This peer review has survived to the present and represents a great contribution to the quality of publications.

The first American medical journal, *Medical Repository*, was published in New York in 1797, more than a century after Thacher's publication. In 1804, the success of the *Medical Repository* led Dr. John Redman Coxe to publish the *Philadelphia Medical Museum*. In 1820 the *Philadelphia Journal of the Medical and Physical Sciences* was published by Dr. Nathaniel Chapman to refute the disparaging remark in the *Edinburgh Review*, "In the four quarters of the globe, who reads an American book? or goes to an American play? or looks at an American picture or statue? What does the world yet owe to American physicians or surgeons?" This statement was a challenge to Chapman and was carried on the title page of the journal as long as he remained the editor. In 1828 this periodical merged with the *Philadelphia Monthly Journal of Medicine and Science* and became the *American Journal of the Medical Sciences*. By 1876, when there were 46 medical journals published in the United States, John Shaw Billings felt that the *American Journal* was the only periodical of real merit because of its editorial policies, selection of original articles, and the presence of criticism and reviews.

John Shaw Billings (1838-1913) and Sir William Osler (1849-1919), two giants of 19th century American medicine, were close friends. Billings was undoubtedly our country's greatest bibliographer and librarian. Osler, the Canadian transplant, became our most notable medical teacher and clinician. Billings' creation of the *Index-Catalogue* and *Index Medicus* remains one of America's greatest contributions to medicine; Osler's *Principles and Practice of Medicine* was the best systematic textbook during this period.

Osler, discussing the importance of the medical library in the continuing education of the physician wrote, "For the general practitioner a well-used library is one of the few correctives of the premature senility which is so apt to overtake him. Self-centred, self-taught, he leads a solitary life, and unless his every-day experience is controlled by careful reading or by the attrition of a medical society it soon ceases to be of the slightest value and becomes a mere accretion of isolated facts, without correlation. It is astonishing with how little reading a doctor can practice medicine, but it is not astonishing how badly he may do it."[1]

During our present century a virtual explosion of medical literature has occurred. The emergence of new disciplines in basic medical science to accompany clinical practice was clearly reflected in the numbers and the titles of new scientific books and journals. Before 1900, American physicians and scientists often submitted manuscripts for publication in foreign journals. After the turn of the century most Americans attempted to publish their scientific and clinical observations in the American literature. In any examination of American medicine one must distinguish between the large amount of uncritical and anecdotal writing which characterized the 18th and 19th centuries and the more scientific and technical writing which has appeared in the 20th century. Although the former gives an image of medicine as a reflection of the civilization of the time, the latter more clearly portrays the evolution of scientific ideas, concepts, and inventions. When it became generally accepted that research was incomplete until published, there was a further increase in the number of manuscripts and reports dealing with scientific and social aspects of human health and disease. The published literature expanded at such a rate that it was soon necessary to increase greatly the number of abstract journals.

In recent years there has been a change in the format as well as the character of medical literature. A relatively new type of publication emerged after World War II when medical newsletters and controlled circulation medical magazines were introduced. Supported largely by advertising, they began to compete with

more conventional medical periodicals for the time and attention of the busy practitioner. Much of the information appears in lay language making it easy for the nonscholarly or nonscientific health professional to scan quickly the highlights of medical advances. For those who later seek and study the full medical reports this form of writing serves a useful alerting purpose.

Medical textbooks have also changed in character. It is rare that a single author attempts to write a comprehensive textbook in any field or discipline. Since 1950 most textbooks have been written by joint authors or by a large number of contributors who prepare chapters for inclusion in large texts compiled and edited by experts in the field. This reflects the complexity of modern medicine and has served to make texts more authoritative and timely.

The critical review which has served as a means of analyzing and selectively synthesizing information has not flourished in this century. Although most physicians and scientists seek information in this form they are apparently unwilling or unable to prepare carefully documented objective reviews themselves. This is a serious shortcoming of modern science. Greater efforts are needed to support and subsidize such writing by recognized leaders of American medicine.

Sir Theodore Fox, former editor of *Lancet*, has described[2] the present inadequate methods of transmitting medical information as a crisis in communications. He characterized the role of medical journals in terms which suggest that they have outlived their usefulness. It is becoming apparent that we are approaching the period when the conventional journal will be replaced by more efficient, timely, and less costly mechanisms for information transfer. A medical press designed to record significant medical events and observations will probably continue but it will be associated with other more dynamic audiovisual and electronic means of communication. Physicians and scientists will have several options available for dissemination of their findings and will no longer be solely dependent upon the written word for priority or prestige.

Kronick, in a study[3] of the history of early scientific journals, questions whether the development of new communications technology adversely affects scholarship. Perhaps it does; however, it also makes the dissemination of new knowledge much easier and thus has more social utility. It is important therefore that a new bibliographic apparatus evolve concurrently with the proliferation of new communications media. If this is done the integrity of the "literature" can be maintained even though it appears in radically new and different formats.

Libraries are rising to the challenge by transforming themselves from passive repositories of printed matter to active centers of biomedical information. The National Library of Medicine now employs computers, audiovisual techniques, photographic methods, television, and satellites for disseminating not just bibliographic data but more complete biomedical informational messages. The "literature" thus will be expanded to include information in many forms and formats and will be delivered rapidly to those who wish it or need it.

In a volume dedicated to the nation's centennial celebration, Billings wrote: "At the commencement of the Revolutionary War we had one medical book by an American author, three reprints, and about twenty pamphlets."[4] Today the National Library of Medicine holds 1.5 million items and about 30 percent of the medical journals being published originate in the United States of America. No doubt within the next several decades it will be possible for all medical information to be transmitted with great speed and accuracy to any physician located anywhere on Earth. The major problem will be to select the most appropriate information for the problem at hand. To deal with this, medical educators must teach students where to get the information they need rather than attempt to force them just to memorize the information itself. Man's brain, remarkable and versatile as it is, simply will not be capable of acquiring and indefinitely retaining the vast amount of new knowledge generated by the biomedical sciences.

REFERENCES

1. Osler, Sir William. *Aequanimitas* Philadelphia: Blakiston's Son & Co., 1932. p. 211.
2. Fox, Theodore. *Crisis in communication:* The functions and future of medical journals. London: Athlone Press, 1965.
3. Kronick, David A. Studies of the early scientific journal: I. The basic source lists. *Texas Rep Biol Med* 32:61-74, 1974.
4. Billings, John S. Literature and institutions. In: *A Century of American Medicine, 1776-1876*. Edward A. Clarke, et al. Philadelphia: Lea, 1876. p. 293.

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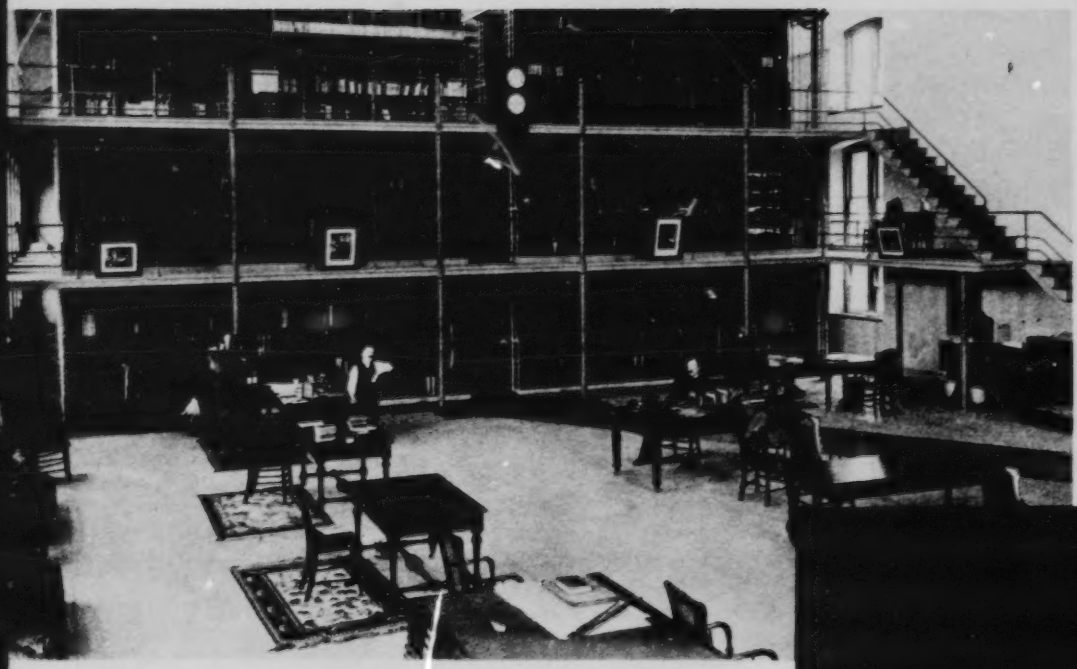
CHAPTER II FROM FASCICULUS TO



Above: Reading room of the Army Medical Library. Opposite: Indexer reviews journal articles and assigns medical subject headings.

ON-LINE TERMINAL: ONE HUNDRED YEARS OF MEDICAL INDEXING

Scott Adams, Deputy Director 1960-1970, NLM
Davis B. McCarn, Associate Director, Computer and Communications Systems

1876-1960*

The bibliographic contribution of John Shaw Billings and his successors is part of a tradition in which the National Library of Medicine takes justifiable pride. So, too, is the twentieth century incarnation of the Billings tradition: the MEDLARS/MEDLINE system. The bibliographic continuum represented by these two contributions is unique in the annals of science. No other scientific specialty and no other country can demonstrate so long or so productive an indexing tradition as that which has led from the *Specimen Fasciculus of a Catalogue of the National Medical Library*, 1876, to today's MEDLINE. This bicentennial *Report* offers an opportunity to reflect on this century of bibliographic productivity at the National Library of Medicine and its predecessors, the Armed Forces Medical Library, the Army Medical

*By Scott Adams

Library, and the Library of the Office of the Surgeon General, U.S. Army.

The history of the Library's index publications divides conveniently into three periods: the first twenty years, 1876-1895, were the growth years, culminating in the completion under Billings of the First Series of the *Index-Catalogue;* the next fifty years, 1896-1945, were the lean years of struggle and survival; and the last thirty years, 1946 to date, the years of renaissance.

The Growth Years

Following the successful publication of two book catalogs for the growing Surgeon General's Library (1871 and 1873) and a comprehensive subject bibliography of cholera (1875), Billings conceived of a book catalog which would combine an author and subject listing of the Library's books, dissertations, and pamphlets with a subject listing only of the medical papers in its journals and transactions. In what may fairly be described as a prototype "feasibility study," Billings printed a small edition of a *Specimen Fasciculus* for evaluation by the medical and the library communities. "Should it be published?" he asked. The question was for Congress to decide "as to whether the result would be worth the expenditure . . . What is the value of such an index to the people of the United States as compared with an expedition to the North Pole, five miles of subsidized railroad, one company of cavalry, or a small post-office building?"

Physicians and librarians alike responded enthusiastically. The AMA appointed a committee to solicit the House Appropriations Committee for funds for the subject catalog of the "National Library." Dr. Oliver Wendell Holmes, in his dedicatory address for the Boston Medical Library (Dec. 3, 1878), stated that the proposed work "would have excited the admiration . . . of the profession in all centuries," and urged Congress to appropriate liberally for the support of the work. Charles Ammi Cutter expressed the hope of all librarians and physicians "that the funds for the printing will be forthcoming, for nothing more fitting to facilitate medical study is likely to be produced in this country."

Thus persuaded, Congress appropriated funds, and after four years of preparation Billings, now joined by his alter ego and lifelong colleague, Dr. Robert Fletcher, published Volume I, A to Berlinski, of the *Index-Catalogue of the Library of the Surgeon General's Office*, 1880.

Fifteen years later, the alphabetical series was to be completed with Volume XVI, W to Zythus, after publishing subject entries for 168,537 books and 511,112 journal articles, and author entries for 176,364 books. Until the end of the First Series, Billings saved the bibliographic slips for the journal articles against the possibility that funds might be found to publish an author listing.

While Billings insisted that the *Index-Catalogue* was not a bibliography of medicine but a catalog of the contents of one library, with the added advantage of being able to consult the work cited either by visit or by interlibrary borrowing, he also took great pride in the Library's completeness. In 1878, even before the publication of the *Index-Catalogue*, he estimated that the Library had more than 75 percent of all the medical periodicals published to that time. In 1891, he estimated that over 90 percent of the medical literature published in the previous ten years was in the Library.

The fact that the *Index-Catalogue* was a library catalog, like that of the British Museum, published in an alphabetical dictionary form, offered both advantages and disadvantages. Publication being constrained by the alphabet, the *Catalogue* could never be current. On the other hand, by assembling subject references retrospectively over periods of years, the *Index-Catalogue* compiled periodic subject bibliographies which greatly facilitated the writing of textbooks and review papers. Thus Sigmund Freud, intending a review paper on cocaine, was at a loss on how to assemble his references until his colleague, Dr. Ernst Von Fleischl-Marxow, introduced him to Volume 4, 1883, of the *Index-Catalogue*, recently received by the library of the Gesellschaft der Aerzte, Vienna, where he found the cumulated references he needed under Erythroxylon (coca). It is interesting to speculate about the extent to which this feature of the *Index-Catalogue* promoted the quantity and quality of American medical literature.

On the other hand, as we shall see later, this alphabetical constraint constituted the "Achilles heel" of Billings' grand design. Even as the First Series drew to a close, the problem arose. As Billings reported in 1891, with a publication rate of a volume a year, the backlog of unpublished references expanded. The cumulation from 1880 to 1891 of these references under A to S amounted to 70,000 author and 240,000 subject titles. By the time

the First Series would be ended (1895), Billings estimated that at the current rate of increase there would be enough references on hand to publish a supplement or Second Series of six volumes.

To complement (or perhaps compensate for) the alphabetically organized *Index-Catalogue*, Billings and Fletcher organized as a current outlet for their indexing the *Index Medicus: a Monthly Classified Record of the Current Medical Literature of the World*. Unlike the *Index-Catalogue*, the *Index Medicus* was to be published commercially by the well-known library and bibliography publisher, F. Leypoldt, at a price of $3 per year. Fletcher assumed the editorial burden for this new publication, which included an annual author index and a minutely subdivided subject index. The first volume (1879) contained as well a monthly medico-historico-bibliographical *Notes and Queries* to which Billings, Fletcher, and Thomas Windsor contributed.

The First Series of *Index Medicus* (1879-1898) did not suffer from an overabundance of subscribers. When Leypoldt died in 1884, the "hazards of the venture" (as Fielding H. Garrison, its later editor, termed them) were undertaken by George S. Davis of Detroit, and when he failed in 1894, Dr. Fletcher took over and assumed the management as well as the editorial responsibilities, with Rockwell and Churchill of Boston serving as publishers.

By now the price was $25 per year. Its subscription list was modest. In 1891 of a total of 482 subscribers, 90 were from the U.S. Army Medical Department, 224 from other institutions in the United States (mostly libraries), and 168 from other countries. Sir William Osler appealed to his fellow physicians at a meeting of the American Medical Association to support the publication, but to no avail. The First Series closed with its 21st volume, April 1899.

Within six months of its closure the Institute of Bibliography in Paris had organized and announced its successor, *Bibliographia Medica, (Index Medicus)*, a monthly publication representative of the international bibliography of the medical sciences and organized by the Universal Decimal Classification. Two highly respected French physicians, Dr. C. Potain and Dr. Charles Richet, were its Directors, and Marcel Baudouin served as its Managing Editor. The Editor promised many improvements, typographic and substantive, including the use of a "machine a composer" alleged to have great advantages for bibliographic publication.

Billings, in the meantime, had become a principal adviser to Andrew Carnegie in matters relating to libraries and bibliography. When the Carnegie Institution of Washington was organized, Billings became a member of the Executive Committee and later Chairman of the Board of Trustees. In this capacity he made a grant of $12,000 to Fletcher for the resumption of the *Index Medicus*, and the first volume of the new series, under Fletcher's editorship, appeared in 1903, while the *Bibliographia Medica* closed down after publishing three volumes, 1900, 1901, 1902.

The bibliographic techniques used by Billings and Fletcher in compiling the First Series of the *Index-Catalogue* and the *Index Medicus* have a particular fascination for us today. As Garrison describes it, as the bound files of journals bought for the *Index-Catalogue* arrived, "Dr. Billings, with characteristic energy, set about the task of checking their contents for indexing, occupying even his private leisure with this work. Almost every day, a government van would leave a wagon load of bound periodicals at his residence in Georgetown and the next morning would find their principal articles, cases, and essays carefully checked, by lead pencil markings, for the copyists in the office. This night work continued until the gigantic task of indexing all the bound periodicals was accomplished, but even in later days, when he had only the current unbound periodicals to deal with, Billings still continued to take some of these home in his overcoat pocket or would have them sent up in baskets for checking."

With minor variations, throughout its history the work plan involved the assignment of responsibility for descriptive bibliographical work to trained clerks (converted Army hospital stewards, in Billings' time), and the reservation of medical indexing, and editorial control to the physician-editors.

A thorough study of the subject organization of the *Index-Catalogue* would provide rich materials for a history of medicine. An early student of nosology, Billings based his structure on the Royal College of Physicians of London's classification of disease, which was in turn founded on the system of Dr. William Farr. However, as Garrison notes in his *Memoir* of Billings, the rapidity of growth of medical knowledge in the latter half of the 19th century convinced Billings that any arbitrary and fixed scheme was doomed to early obsolescence; the structures of the successive volumes of the *Index-Catalogue* and the *Index Medicus* alike reflect the evolution of medical concepts and terminology of the time.

By 1891, the *Index-Catalogue* required some 20,000 main and subordinate subject headings, and Billings and Fletcher were required to commit to memory some four to five thousand of these. Each issue of the Second Series of the *Index Medicus* (1902-1920), edited by Fletcher and Garrison, carried at its masthead the following cautionary notice: "The classification . . . is based as far as possible on the latest accepted views in medicine. Nevertheless, it is to be remembered that the bibliographer has had to deal with all the matter which comes to his hand, some of which may be unassignable under a strict classification."

The Lean Years

The fate of the First Series of the *Index Medicus* foreshadowed the struggle for survival endured by both of the Library's index publications during the following fifty years, 1896-1945.

On the death of Fletcher in 1912, Dr. Fielding H. Garrison became Principal Assistant Librarian and assumed responsibility not only for editing the *Index Medicus* but for the preparation of the subject bibliographies of the *Index-Catalogue* as well. The subvention from the Carnegie Institution assured its continuation through a Second Series (1902-1920) and well into a Third Series (1921-1927) edited by Garrison and Dr. Albert Allemann.

An editorial in the July 1, 1916, issue of the *Journal of the American Medical Association* criticizing the *Index-Catalogue* as "out of date and valuable only for research purposes" and the *Index Medicus* as "so elaborate and so inclusive that it is of practical value to few but research workers," announced the publication of a new medical index, the *Quarterly Cumulative Index to Current Medical Literature*. The AMA index had two novel features: its four issues per year were cumulative and dictionary in arrangement. Its appearance precipitated a series of efforts over the next forty-three years to rationalize the coexistence of the partially competitive medical indexes: the *Index Medicus* the *Index-Catalogue*, and the new *Quarterly Cumulative Index*.

For an understanding of the Library's plight, a brief retrospective look at the fate of the *Index-Catalogue* during these lean years is necessary. The "supplement" of six volumes foreseen by Billings became twenty-one by the closing of the Second Series in 1915. Under the editorship of Fletcher and Garrison, and a series of distinguished Library Directors whose names included Maj. Walter Reed, General Walter D. McCaw, and Col. Champe C. McCulloch, copy and appropriations were found to assure their regular publication, one per year, by the Government Printing Office.

Toward the end of the Second Series, a number of circumstances conjoined to threaten the continuation of the *Index-Catalogue*. Billings and Fletcher were gone, Garrison was overworked, the War in Europe had cut journal receipts by 50 percent, the card files were bulging with unpublished references. Following long discussions, Garrison and Col. McCulloch, then Librarian, distributed a circular letter proposing the replacement of the *Index-Catalogue* on the completion of the Second Series with alternative plans.

The responses of the medical profession and of the librarians alike during the spring and summer of 1916 were prompt and vigorous. The faculty of Johns Hopkins University, medical societies of Massachusetts, New York, Philadelphia, Chicago and Maryland adopted resolutions of protest. The Medical Library Association resolved that the scheme to depend on the monthly issues of the *Index Medicus* or on special subject bibliographies would not do. The *Index-Catalogue* was indispensable. It must go on to a Third Series.

With Volume 1 of the Third Series (1918), reprints and less significant titles were omitted to conserve space. Funds for the third volume were first withheld and later withdrawn, resulting in a three-year delay of its publication. In contrast to the annual publication of volumes of the Second Series, volumes of the Third Series did not appear during the years 1917, 1919, 1921, 1924, 1927 and 1930.

In his 1921 report to the Surgeon General, General Robert E. Noble, the Librarian, made the first of a series of proposals to convert the alphabetical order of the *Index-Catalogue* to an annual serial form. The backlog of the unpublished references would be published in a crash program over the ensuing seven years, thus closing out the Third Series. Subsequently, each volume would be an annual catalogue of the current medical literature. By 1925 the Librarian, Col. James M. Phalen, had taken a drastic step to insure prompt publication of current indexing. The subject entries for material published after January 1, 1926, were to be omitted from the rest of the Third Series of the *Index-Catalogue* and to be published only in the *Index Medicus*.

This decision coincided with the negotiations between the Library, the Carnegie Institution, and the American Medical Association for the merger of the *Index Medicus* and the *Quarterly Cumulative Index to*

Current Medical Literature. These were successfully concluded, and the first volume of the *Quarterly Cumulative Index Medicus* appeared in April 1927. The cooperative venture involved the indexing of the foreign literature and supplemental English language literature by the Library's staff, and the editing, printing and distribution by the American Medical Association. This cooperation continued until December 1931, when logistics and other technical difficulties conspired to defeat it. Dr. Allemann retired as Editor of the *Index-Catalogue* in February 1932 and was succeeded by Dr. Claudius Franz Mayer. Their combined talents helped to produce the tenth and last volume of the Third Series of the *Index-Catalogue*, 1932, which also saw a collaborative effort by Garrison and Mayer to produce a supplemental catalog of the Library's incunabula and 16th century books (1500-1525).

Three years of lapsed appropriations during the Great Depression deferred the initiation of the Fourth Series until 1936, although the first 112 pages of the first volume had been set in type four years earlier. In a historical preface to this volume, Major Edgar Erskine Hume, Librarian from 1932-1936, promised to remedy the deficiency resulting from Col. Phalen's decision to omit currently published material. The entries, representing publications of 1926-1932, would be published as the succeeding volumes of the Fourth Series appeared.

Under Dr. Mayer's editorship, a number of valuable bibliographical supplements to the *Index-Catalogue* appeared. The Garrison-Mayer listing of incunabula has been mentioned. The third volume included a provisional reference list of congresses and conferences; the fourth volume a prospectus of a *Bio-Bibliography of Sixteenth Century Medical Authors*, planned for use in fascicules with future volumes of the *Catalogue*. Together with Col. Harold W. Jones, who directed the Library from 1936-1945, Dr. Mayer conceived the idea of a world catalog of medical books.

The Fourth Series appeared destined, in the years immediately preceding World War II, to become an exemplary archive for medico-historical scholarship, leaving to the American Medical Association the responsibility for subsidizing the indexing of current medical publications.

The Renaissance Years

With the coming of World War II, unprecedented demands were made on the Library and on its bibliographical apparatus. The research programs sponsored by the Office of Scientific Research and Development depended on its collections for biomedical information. Medical intelligence services in the Armed Forces severely tested its resources for geomedicine in preparation for global combat. Medical officers in the Armed Services, stationed all over the world, looked to it as a source of current professional information.

It was in response to this latter need that the *Current List of Medical Literature* was launched. In 1934 Dr. Atherton Seidell, a retired government research biochemist, together with Dr. Watson Davis persuaded the Department of Agriculture Library to establish Bibliofilm Service as a means of increasing the availability of the materials of research. In 1937, Seidell persuaded Col. Harold W. Jones to establish a Medicofilm Service in the Army Medical Library. To promote the use of the microfilms, Seidell founded the "Friends of the Army Medical Library," whose function it was to publish a weekly listing of the tables of contents of journals received in the Library.

The journals were categorized in the *Current List* under 44 broad headings, a crude arrangement which occasioned public criticism. Nonetheless, a communication to *Science* called it "potentially by far the most important index of current literature in any scientific field," and in its first year it attracted 700 subscribers. Further, the *Current List* had achieved an outstanding success in helping to keep uniformed medical officers currently informed.

In 1945, the Library decided to assume responsibility for the *Current List*, which heretofore had been supported jointly by the "Friends" and the Medical Library Association, and to respond to the criticism by providing monthly subject indexes. The first few years of governmental operation were rocky ones. Heroic efforts were made by the Library's Catalog Division and by volunteers to maintain production. Stabilization was achieved by 1950 with a reorganization under the direction of Col. Frank B. Rogers.

The *Current List* story, however, must be viewed against the background of a more fundamental change in the Library's fortunes, a change which led ultimately to the demise of the *Index-Catalogue*. The Library's difficulties in responding to wartime challenges led Col. Harold W. Jones in 1943 to an effort to modernize the institution. With Rockefeller funds, a survey team organized by the American Library Association reviewed the Library's operations and programs, and made

21 20

several recommendations for improving the *Index-Catalogue*.

The medical profession's interest in the Library had steadily risen with the growth of wartime research. Surgeon General Norman T. Kirk had appointed a number of advisers to the Library who, in October 1944, held their first meeting as an Association of Honorary Consultants. The Consultants took an immediate interest in the redirection of the Library's programs, including the future of its medical indexing activities.

Serious consideration of this problem, however, was to be the task of a new advisory committee, conceived and organized by Col. J.H. McNinch, who had succeeded to the Library's Directorship in 1947. This committee, organized in July 1948 under the Chairmanship of Dr. Lewis Weed, was charged with the responsibility of studying the indexing requirements of modern medical science and the ability of the Library's two indexing publications to satisfy them. To insure concurrent consideration of the *Quarterly Cumulative Index Medicus* (QCIM), Dr. Morris Fishbein of the AMA was made an ex-officio member; and to provide the Committee with a fact-finding and investigatory capability, a contract was negotiated with Johns Hopkins University.

This contract established the Welch Medical Indexing Project, headed by Dr. Sanford V. Larkey. One of the earliest interests shown by the Consultants and Library management alike had been the potential application of automatic data processing equipment to the publication of indexes. At a December 1947 Symposium on Medical Subject Headings sponsored by the Library in the Pentagon, for example, Col. McNinch led the participants through the Medical Statistics Division of the Army Medical Department, suggesting to them that they consider the application of the punched card equipment then in use to medical bibliography.

It is understandable, therefore, that the Welch Medical Indexing Project assigned high priority to the investigation of "machine methods." It compiled a pilot list of 7,000 medical journals, and with the help of its staff member, Eugene Garfield, developed a potential system for preparing the *Current List* from punched cards and a prototype search system. The Project also investigated the theory and practice of medical subject headings and, through key-punching the *Current List* subject headings, facilitated their later revision.

The Project reported regularly to the Committee of Consultants for the Study of Indexes to the Medical Literature, which was engaged at the time in discussing questions relating to the needs for and uses of medical indexes. At its seventh meeting, December 16, 1949, the Committee recommended the discontinuance of the *Index-Catalogue* and the substitution for it of a current index based on the *Current List of Medical Literature*.

The alphabetical straitjacket in which Billings had confined the *Index-Catalogue* was a principal cause of its undoing. While research on malaria and antimalarials had been a top wartime priority, the "M" volume which contained thousands upon thousands of references on malaria could not be published until the war was over. The Library never did publish its thousands of references on penicillin, because the "P" volume was never issued. While many defenders of the *Index-Catalogue* were made unhappy by the decision, most users accepted the decision and looked forward eagerly to the new and improved *Current List*.

Under the direction of Col. Rogers and the capable editorship of Seymour Taine, the *Current List of Medical Literature* had been redesigned in 1950. A register section listed articles in serial numbered order under their journal titles. An author index and a subject index using standardized headings were clued to the descriptive bibliographic data included in the registry section by means of the serial numbers. To compose the monthly publication, cards bearing the information were "shingled" and photographed.

During this developmental period, the pursuit of standardized subject headings for medical indexing became a major preoccupation of the Library. The exploratory work done by the Welch Medical Indexing Project contributed to the efforts of the *Current List* staff to develop a Subject Heading Authority List which was used until 1959. Dr. Rogers laid the philosophical foundations for further development in a paper which concluded that there were basic similarities between subject headings to be used for Library cataloging and for indexing. This concept was implemented in the first edition of *Medical Subject Headings* (MeSH), 1960. With the planning of MEDLARS in 1960, a new approach was taken. Coordinate indexing, developed by Mortimer Taube as a mechanism for accomplishing searches in accordance with Booleian logic, dominated the intellectual approach to subject analysis, and the second edition of MeSH, prepared with machine retrieval in mind, reflects the constraint of this approach.

The *Current List* steadily increased its coverage during the 1950s, reaching 110,000

articles by 1958. Continuing efforts were made to find a basis for cooperation with the QCIM, but a workable solution eluded officials of the Library and the AMA. The costs of subsidizing the QCIM were becoming an increasing concern to AMA management; the possibility of mechanizing its production were explored unsuccessfully, and finally AMA decided to discontinue its publication in 1959.

The Age of Automation

Operational experience in producing the *Current List* had inspired the Library's management with the confidence to take the next steps toward mechanization. Dr. Rogers reported to the Board of Regents in November 1957 on progress, problems and possibilities in indexing. The Board endorsed the solicitation of funds from an extragovernmental source, the Council on Library Resources, which made a two-year grant to the Library of $73,800 to "develop and demonstrate in the field of medicine improved methods for the rapid and efficient publication of comprehensive indexes to the literature . . . making use of hitherto unutilized mechanical applications."

This two-year development effort resulted in a significant breakthrough for a mechanized index publication system. Flexowriter composing machines for the index copy, IBM key-punches and sorters for the alphabetizing of the copy by author and subject, and a Listomatic step-and-repeat camera for composing column-width film were combined into an operational system.

The decision was made to phase out the *Current List* with its December 1959 issue, and to restore to the Library once more the *Index Medicus* title and tradition. As a special bonus, this new publication method offered a renewed opportunity to work out a means of collaboration with the American Medical Association. An agreement was reached whereby the Library successively cumulated and interfiled the cards after each monthly issue was composed, and photographed the cumulation in December. The film was then delivered to the AMA which printed, bound, and distributed the new annual publication, the *Cumulated Index Medicus* (CIM).

Although this system provided the process by which *Index Medicus* was published from August 1959 to December 1963, it was quickly evident that it could not serve as a retrieval system. The state of the art in those days of automatic data processing dictated that the system be "card bound." The fastest card-sorter then available could handle 1,000 cards per minute. To search a five-year file of 750,000 subject cards would take twelve and one-half hours.

The conclusion reluctantly reached by the Library was that a retrieval system could not be successfully grafted onto a publication system but that it might be more suitable to invert the objectives, that is, to start with the design of a retrieval system from which a publication system could be later derived. This was to become the underlying strategy of MEDLARS.

It was this inversion of objectives in combination with several other factors—a long and successful experience in processing large volumes of indexing, a hard-earned mastery over the theory and practice of medical subject headings, and the success of the Index Mechanization Project—which generated the necessary confidence to develop a computer-based system for the dual purpose of information retrieval and index publication.

1960 to Present*

In April 1959, Dr. Robert S. Ledley of the George Washington University School of Engineering was engaged to investigate the feasibility of using a computer to publish *Index Medicus* and to serve as a basis for an efficient reference and bibliographic service. By the end of 1960, the National Library of Medicine had developed the specifications for a computerized system. The National Heart Institute lent sympathetic support to the Library's effort, and at its fall meeting in 1960 the National Advisory Heart Council approved the transfer of $500,000 to initiate the project.

Bids were sought in the spring of 1961. Twenty-five proposals were submitted. The Library selected the General Electric Company to begin the design and development of the system which by now had been named MEDLARS (Medical Literature Analysis and Retrieval System). The MEDLARS development effort took three years and cost some $3 million. A Honeywell 800-200 computer system was delivered to the Library in March 1963. During 1963, the Indexing Division ran parallel programs to produce the *Index Medicus* on schedule, and to build up a data base for MEDLARS search. After final system testing, the first issue of *Index Medicus* was

*By Davis B. McCarn

Input typing (left) for MEDLARS (top). MEDLARS data bases are accessible via on-line terminals (above).

produced from the MEDLARS system in January 1964. Slippage in the completion of the complex ZIP Photon photocomposer, known as Graphic Arts Composing Equipment (GRACE), deferred its use until the August 1964 issue. GRACE was at that time the nation's fastest computer-driven phototypesetting system. Retrieval searches were accomplished experimentally in a batch mode during the fall months of 1963, but were not made available to other than NIH research scientists until 1964.

MEDLARS not only achieved the automation of the publication of *Index Medicus*, but it also made possible the publication of recurring special bibliographies and the development of a retrieval service. In late 1964 planning began for the implementation of a network of search formulation centers and of decentralized search services. By 1968, there were 12 formulation centers in the U.S. and several in foreign countries. MEDLARS searches were being performed on four computers outside the Library. By 1974, about 70,000 individual searches had been performed for health professionals throughout the world. In 1965 the Interim Catalog Module was developed and production of the *Current Catalog* on the computer was initiated.

Throughout this development program, a major objective of the Library was the expansion of *Index Medicus* to allow more timely indexing and expanded coverage of the growing medical literature. This led the Library to begin planning for on-line input of indexed material in 1965. In June 1968 a contract was signed to develop a new MEDLARS II system to provide on-line communication between indexers and the computer system.

In parallel with this development, experimentation with on-line retrieval of bibliographic information was conducted. The first testing began in the fall of 1967 and was directed toward testing available retrieval systems and specifying the requirements for a retrieval service as part of the national Biomedical Communications Network. This

investigation and evaluation resulted in the decision to mount a demonstration service using the same selected 100 journals covered in *Abridged Index Medicus* and relying, in part, on the Teletypewriter Exchange Network. This service, called AIM-TWX, was an immediate and resounding success and attracted more than 90 user institutions in its first year of service (1970-1971). This success led to the implementation of an expanded service, MEDLINE (MEDLARS On-line), begun in October 1971 with 25 initial users, including former MEDLARS search formulation centers, the Regional Medical Libraries, and selected institutions in the Washington, D.C. area. At the same time, an information service in toxicology, TOXICON (now TOXLINE) began operation on a contractor-operated computer. This service provided on-line bibliographic retrieval services against a composite data base drawn from the major organizations indexing the literature concerning the toxic effects of biochemicals on biological organisms.

The initial MEDLARS II contract was terminated in April 1971. In June 1971, the National Library of Medicine began developing under a contract with the System Development Corporation a MEDLARS II directed toward on-line searching. This new system was delivered and accepted in January 1975, and is now the system through which the Library produces *Index Medicus*, its recurring bibliographies and catalogs, and provides on-line retrieval services.

These on-line services have become increasingly important to the nation's health community. Use of the services accelerated greatly when actual network access capability was achieved in February 1972. In 55 cities, through MEDLINE (MEDLARS On-Line), one could obtain on-line literature retrieval services on the Library's computer from a remote terminal via a local telephone call. The Library was the first information organization to make use of a commercial "value added" communications network. In February 1973, a second service computer at the State University of New York (SUNY-Albany) was added to the MEDLINE network to provide additional searching capacity and backup for the Library's computer. And a year later, the TOXICON service was moved to the Library computer to become TOXLINE (Toxicology Information On-Line) and provide improved, less costly on-line searching service across the country to a growing number of users.

The National Library of Medicine now operates one of the most advanced computer facilities. Two IBM 370/158 computers, coupled together as a multiprocessor system to operate as one, provide 66 hours of on-line search service per week to more than 400 institutions in this country and Canada, England, France, as well as to the World Health Organization in Geneva. In support of the Library's computer operation, the SUNY computer provides 49 hours of searching service, making a total of 78 hours of available service per week. The computer programs of the Library and its MEDLINE data bases also operate on computers in Australia, Brazil, and Sweden. Each month in the U.S. the Library's computer network provides 6500 terminal hours of service and allows users to perform a total of 35,000 searches (an annual rate of 420,000).

By the end of FY 1975, the Library was providing on-line services from ten major data bases containing over 2,000,000 citations or other information records. These bases are described below.

MEDLINE (Medical Literature Analysis and Retrieval System On-Line) is a data base containing references to about half a million citations from 3,000 biomedical journals. It is designed to help health professionals find out easily and quickly what has been published recently on any specific biomedical subject. MEDLINE contains the current year's citations plus two previous years. Further coverage is provided by ancillary files such as BACK66 (545,000 citations), BACK69 (649,000 citations), and BACK72 (230,000 citations) which cover the biomedical literature from 1966 to 1972. A data base containing only the current month's citations, called SDILINE, is a subset of MEDLINE that provides a current awareness ("selective dissemination of information") service. MEDLINE is updated and SDILINE replaced each month.

TOXLINE (Toxicology Information On-Line) contains more than 375,000 references to published human and animal toxicity studies, effects of environmental chemicals and pollutants, adverse drug reactions, and analytical methodology (see Chapter III).

SERLINE (Serials On-Line) is a data base of serial records containing bibliographic and locator information for about 6,500 biomedical serial titles which are current or which ceased publication after 1969. SERLINE is searchable so that it is possible to determine which titles are held

by a particular library or are available within a particular region. SERLINE includes all journals currently indexed in *Index Medicus* and many of the biomedical journals covered by Biological Abstracts, Chemical Abstracts, Science Citation Index, and many other substantive secondary biomedical journals.

CATLINE (Catalog On-Line) is a data base containing more than 140,000 references to monographs and serials cataloged since 1965. The data base was developed to give medical libraries in the Biomedical Communications Network quicker access to cataloging data and thus reduce duplicative original cataloging. CATLINE is also useful as a supporting tool for other library functions including acquisitions, reference, and interlibrary loan activities.

CANCERLINE (Cancer Information On-Line) is the National Cancer Institute's on-line data base of approximately 44,000 citations dealing with cancer therapy and chemical, physical, and viral carcinogenesis. Secondary sources presently included are *Carcinogenesis Abstracts*, 1963-1973, and *Cancer Therapy Abstracts*, 1967-1974. This data base will be expanded to include other aspects of cancer research as well as abstracts and protocols of on-going cancer research. All citations in CANCERLINE have abstracts.

CHEMLINE (Chemical Dictionary On-Line) is the chemical dictionary built by the National Library of Medicine in collaboration with Chemical Abstracts Service (CAS). It provides a mechanism whereby 270,000 chemical substance names representing 76,355 unique substances can be searched and retrieved on-line. (See Chapter III for more information on CHEMLINE.)

AVLINE (AudioVisuals On-Line) is an experimental data base containing references to audiovisual instructional materials in the health sciences. All of these materials are professionally reviewed for technical quality, currency, accuracy of subject content, and educational design. See Chapter VIII, "Audiovisual Services for Health Science Education," for more information on AVLINE. The data base is currently in the test phase of its development.

The Medical Subject Headings (MeSH) Vocabulary File contains complete information on all MeSH main headings and qualifiers (topical, form, time, geographic, and language subheadings). Each main heading or qualifier forms a unit record in the data base. This file contains more than 11,000 records and is updated annually for the new edition of *Medical Subject Headings*. The Name Authority File is an on-line list of personal names, corporate names, and "series decisions" used by the National Library of Medicine. It is designed to enable catalogers to verify the proper form of entry for names and series.

The Journal Authority File contains bibliographic information for all the serials ever indexed for MEDLARS. It contains more than 4,500 records and is updated periodically.

During FY 1975 the Library completed transition from its early retrieval system (ELHILL II) to a new one (ELHILL III) developed under the revised MEDLARS II contract, and all files were converted to the new system. In this process the hierarchical structure of MeSH was expanded to seven levels. In early 1975 the MEDLINE files were regenerated and several additional major improvements made. Beginning with selected 1975 journals, English language author abstracts were added to the retrieval file. At present 38 percent of 1975 citations have abstracts. It is anticipated that this will increase to more than 50 percent. In addition, citations now include the organizational affiliation of the senior author, if included in the article.

To improve retrieval, MEDLINE files are now searchable on any word in a title or abstract; thus, it is now possible to search on both subject headings and text words and to use the two interactively. The new retrieval service also allows searches to be run against files not actually on-line through an "off-

search" capability. This permits searching files of older citations. Finally, a capability to store a search has also been added along with a recurring current awareness service wherein the search formulation is entered on-line by the user but actual retrievals are performed by the computers during non-on-line search service times to provide monthly, individualized, current-awareness searches. In April 1975 an on-line survey was conducted to determine the distribution of use of the new system by type of user and purpose. It updates a similar survey done in March 1973. The results are shown in Tables 1 and 2. It is worth noting that there was a 41 percent increase in total use in April 1975 over March 1973.

Table 1 Percentage Distribution of On-Line Use by Type of Requestor

	March 1973	*April 1975*
Physician	51	41
Nonphysician scientist	12	19
Librarian	3	10
Student	20	10
Other	14	20
Total	100	100

Table 2 Percentage Distribution by Purpose of Search

	March 1973	*April 1975*
Patient care	25	17
Education	22	14
Research	33	44
Other	8	19
Unknown	12	6
Total	100	100

During most of the year TOXLINE was operated under the ELHILL II system. It is being converted to ELHILL III in 1975 consistent with the other on-line services. To control the growth and overall size of the TOXLINE file, the decision was made to split the file during this ELHILL II-ELHILL III conversion into two segments. Thus, the on-line TOXLINE file will provide about 300,000 records from 1971 to the present; a TOXLINE backfile (i.e., pre-1971 literature, about 80,000 records) will be available only for off-line searching.

The citation-duplicate checking software for TOXLINE, built by the Computer Sciences Division of the Oak Ridge National Laboratories, is now operational. It is used to screen certain specialty files that are being used to enrich the basic TOXLINE file and to preclude the inclusion of duplicate records. Such specialty files are in the areas of mutagenesis, teratogenesis, and drug interactions. The duplicate citation checking system is being applied first to the abstract files on the toxicology of heavy metals and other materials assembled by the Toxic Materials Information Center, Oak Ridge National Laboratories.

During this year, an agreement was made with the International Cancer Research Data Bank of the National Cancer Institute. Under this arrangement, the Library mounted a new, on-line retrieval file called CANCERLINE (formerly CCALINE).

The plans of the International Cancer Research Data Bank are to maintain this file with records taken from the Institute's two abstract journals and to include a file of about 6,000 research-in-progress records annually that are being prepared for the National Cancer Institute by the Smithsonian Science Information Exchange. CANCERLINE usage during the last three months of the year has been approximately 60 hours per month, and is increasing as the file becomes richer in content. CANCERLINE is available to all MEDLINE and TOXLINE users and also to certain specific Cancer Information Centers designated by the Institute. It is now also available internationally through the Library's foreign MEDLINE Center partners.

The Board of Regents of the Library twice this year has studied the question of charging for on-line services. In November 1974 the Board recommended a price increase from $6 per hour to $8 per hour which became effective on February 1, 1975. In a second action in March 1975, the Board recognized the need for a premium price for prime-time usage and established policy concerning the charges which the Library should levy, increasing the prime-time (10:00 a.m. - 5:00 p.m., Eastern Time) charge for MEDLINE to $15 per hour and equalizing the charges for all its services. Despite these increased charges, usage has continued to grow.

CHAPTER III MEETING THE NEED FOR

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TOXICOLOGICAL INFORMATION

The Toxicology Information Program of the National Library of Medicine, established in 1967, owes its origin to a Panel of the President's Science Advisory Committee convened to discuss the problems involved in handling toxicological information. President Lyndon B. Johnson, in his preamble to the Panel's 1966 report, stated: "The Panel on the Handling of Toxicological Information has . . . made a number of recommendations. Among these is the recommendation that there be established, by the Department of Health, Education, and Welfare, a computer-based facility to cope with the flood of toxicological information and to make it quickly available . . ."

Toxicological information was defined as "All information descriptive of the effects of chemicals on living organisms or their component subsystems." The Panel members found that toxicological information was generated—and needed—by many segments of society including universities, industries, and state and Federal governments; that this information was widely dispersed through thousands of journals of clinical medicine, pathology, biochemistry, microbiology, etc.; that a significant fraction of this information is neither abstracted nor indexed; and that a large portion exists only in reports that are unavailable to the general investigator.

Experience during the intervening 10 years has proven that the Panel's analyses of some of the basic problems of toxicology and its information support systems were pertinent. These problems have increased in magnitude. While in 1966 there was much concern with the potential adverse effects of new drugs, society is now even more concerned with the biological effects of many new—and not so new—chemicals to which man and his life support systems are exposed. This concern continues to shift from compounds that cause acute adverse reactions to those that have long-term deleterious effects. A toxicological information program must provide methods to make the results of toxicological investigations quickly, accurately, and widely available to those experts who perform research, make regulatory decisions, and monitor the environment. It must help to prevent unknowing duplication of expensive laboratory work.

The Toxicology Information Program was placed in the National Library. The Library has three attributes to accommodate such an effort: (1) it is the world's largest archive in biomedicine; (2) it has no regulatory functions and, therefore, can be neutral in any dispute between Federal agencies and industry; and (3) it is at the forefront of practically all those technological developments on which a growing information program must depend.

Development of the Program

The Toxicology Information Program staff began its work with three questions: (1) Who were the scientists active in toxicology and related areas of science? (2) What types of toxicology information did these scientists need? (3) What information resources were available to this user community? During 1967-1971, the following activities were initiated to answer these questions.

A computerized "Roster of Individual Authorities in Toxicology" was prepared; it contained information about 3,200 scientists.

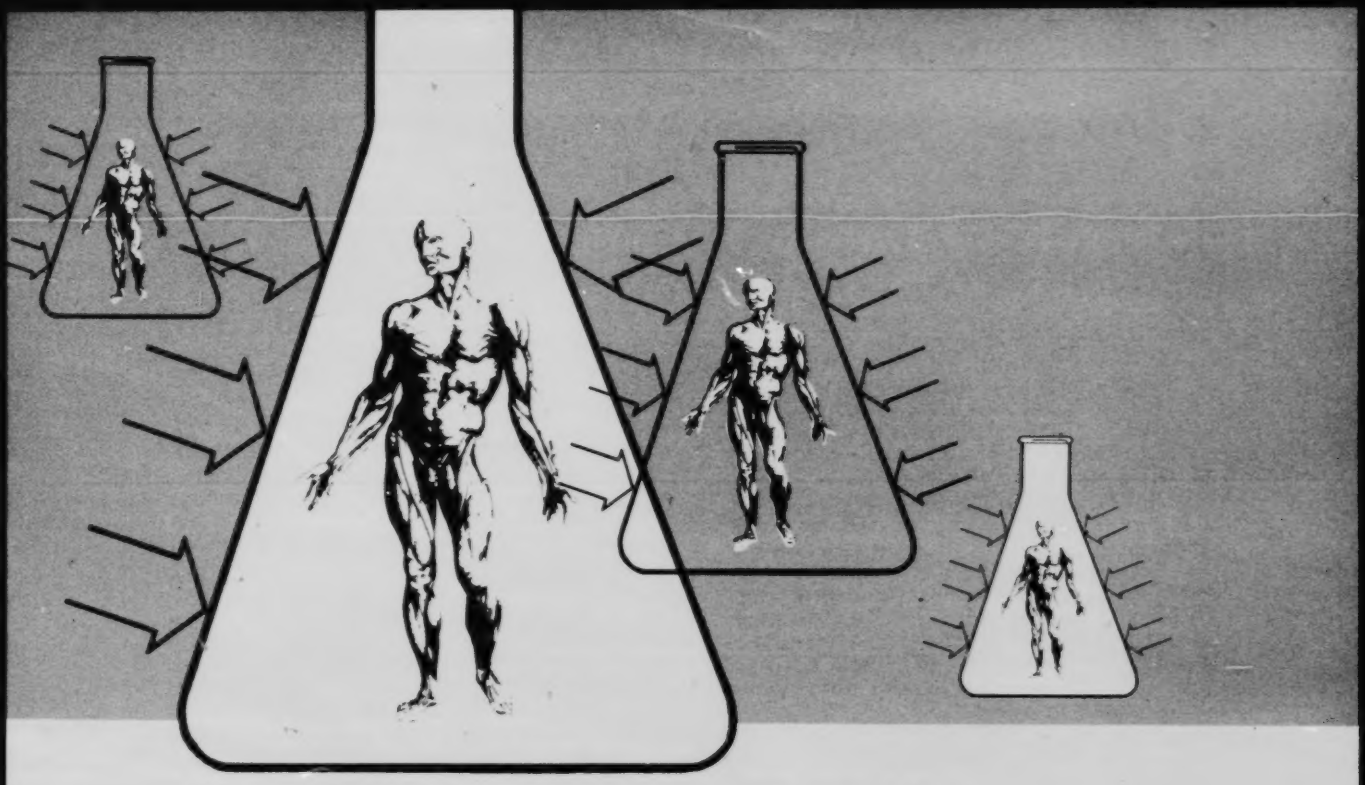
An on-line retrieval file incorporating the data from a survey of "User Needs for Toxicological Information and Data" was created for in-house applications and used to develop some subsequent projects of the Program.

The National Referral Center for Science and Technology of the Library of Congress, under a Library contract, created a "Directory of Information Resources in the United States: General Toxicology."

The University of Pittsburgh analyzed about 25,000 primary journals for their content of toxicological information to create a "core" list of journal sources.

To provide a new literature awareness service, the *Toxicity Bibliography*, a toxicology subset of the Library's MEDLARS data base, has been published quarterly.

The Toxicology Information Program Committee was created under a contract with the National Research Council, National Academy of Sciences, as an advisory group to include experts in toxicology and pharmacology serving for three-year terms.



During the first years of the Program the anticipated rate of growth of resources and staffing was not realized. Funding, projected to reach $5.9 million by 1969, reached $1.38 million; staffing, expected to reach 57, was actually only 18 in 1969. In recognition of these facts, the Toxicology Information Program narrowed its scope and concentrated on certain sub-areas of toxicology such as environmental pollutants (especially pesticides) and drug interactions; this produced the following results:

Computerization, for eventual on-line use, of *Health Aspects of Pesticides Abstracts Bulletin* (HAPAB), now a publication of the Environmental Protection Agency.

Production of an *Index to the Report of the Secretary's Commission on Pesticides and Their Relation to Environmental Health* by complete computerization and on-line text searching and indexing.

Creation of a computer system to manage the data generated by the Community Studies on Pesticides in collaboration with the Food and Drug Administration and the Environmental Protection Agency.

Abstracts on Health Effects of Environmental Pollutants (HEEP), was created in collaboration with Biological Abstracts, as a monthly journal.

Drug Interactions—An Annotated Bibliography with Selected Excerpts; Vol. 1, 1967-70; Vol. 2, 1970-1971; covering reports on drug-drug and drug-chemical interactions in animals and man.

Creation of a Query Response Capability

A Toxicology Information Response Center at the Oak Ridge National Laboratory (ORNL) was established in 1971 with a query-response capability for scientists. It took on an increasingly important role in the development of the Program. This Center, which performs demand literature searches in toxicology, initially provided service without charge. Now there is a fee system for the Center's searches, using as a collection agent the National Technical Information Service which collects $20 per hour with a minimum

TABLE 3 Source of Requests to Toxicology Information Response Center (October 1974-March 197)

	Percent
Federal agencies	65.7
Industrial organizations	12.1
Research institutes	14.2
Universities and hospitals	2.8
State and local governments	2.8
Law firms	0.4
Other	2.0
TOTAL	100.0

charge of $25 for the first hour. Bibliographies produced in response to requests consist of mixtures of print-outs from machine searches of the MEDLINE and TOXLINE data bases, copies of abstracts from *Chemical Abstracts* or *Biological Abstracts*, and typed citations of relevant articles. In May 1975, the Center completed its 2,000th literature search.

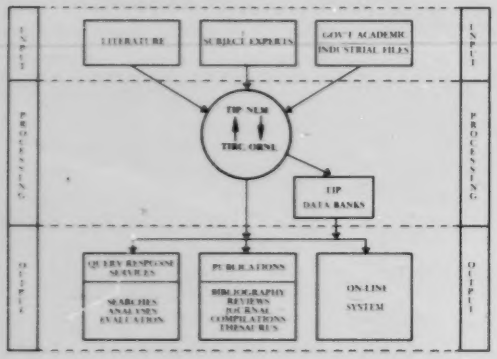
Search bibliographies in subject areas of high public interest are also published and sold through the National Technical Information Service. Extensive state-of-the-art bibliographies on particularly important subjects (e.g., vinyl chloride, asbestos, chloroprene) are prepared directly for journal or other publication, rather than in response to specific requests. Several such bibliographies have been published in the journal *Environmental Health Perspectives*. The Toxicology Information Response Center has also sponsored the preparation of a series of state-of-the-art reviews in toxicology for publication in review journals.

Several Government agencies, including the National Center for Toxicological Research and the Bureau of Foods (both of the Food and Drug Administration), the National Cancer Institute, and Edgewood Arsenal use the Toxicology Information Response Center extensively for literature services and similar support functions.

The Development of On-Line Retrieval Services for Toxicology

Starting in 1970, the Toxicology Information Program formulated two major objectives which still guide its overall planning: (1) create data bases with information taken from the scientific literature and from the files of cooperating governmental, academic, and industrial organizations; and (2) provide toxicology information services for the scientific community.

TOXICOLOGY INFORMATION PROGRAM FUNCTIONS



Publications created by the Toxicology Information Program and the query response activities of the Toxicology Information Response Center represent two major output modes of the Program. A third method of bringing information to users was through the establishment of an on-line retrieval service based on the journal literature of toxicology. This service is called TOXLINE.

While it was natural to follow the "MEDLINE model" for toxicology, this could only be done up to a certain point. In MEDLARS, the medical literature had a structured, computerized system with a controlled journal list, vocabulary, and display format. This system lent itself readily for conversion to the on-line retrieval service which eventually became MEDLINE. However, these elements of structure and control are not as readily available for the literature of toxicology. That literature is not only dispersed over a large number of primary journals but it is also contained in secondary sources that cover biomedicine (e.g., *Chemical Abstracts, Biological Abstracts, Index Medicus*). Therefore, it was decided to proceed by extracting "toxicology subsets" from the computer-readable versions of such secondary sources.

TOXLINE contains full bibliographic citations, almost all with abstracts and/or indexing terms, and Chemical Abstracts Service (CAS) Registry numbers. TOXLINE information is derived from five major secondary sources and one archival collection of citations. The component subfiles currently providing TOXLINE material are:

Chemical Abstracts Service: *Chemical-Biological Activities* (CBAC), from 1965.

BioSciences Information Service: *Abstracts on Health Effects of Environmental Pollutants*, from 1972.

American Society of Hospital Pharmacists: *International Pharmaceutical Abstracts*, from 1970.

National Library of Medicine: *Toxicity Bibliography*, from 1968.

Environmental Protection Agency: *Pesticide Abstracts* (formerly *Health Aspects of Pesticides Abstracts Bulletin*), from 1966.

Hayes File on Pesticides, 1940-1966.

At the present time, TOXLINE serves 84 commercial, 58 academic, 26 governmental, and 2 miscellaneous users (170 total) for an average usage of 340 connect hours (1200 searches) each month.

Future plans for TOXLINE call for enriching the basic files not only with additional abstracts from *Chemical Abstracts* and *Biological Abstracts* but also with specialized literature files covering the areas of teratogenesis, carcinogenesis, mutagenesis, drug interaction, drug interference with laboratory tests, and the biological aspects of drug abuse.

One of the important entry points into toxicological data files is by the chemical substance involved. Proper identification of the substance in these data bases becomes essential. Such identification is not always easy or straightforward because chemical substances are often known by many different names. A new on-line chemical dictionary file, called CHEMLINE, has been created to provide the TOXLINE user with capabilities for efficient on-line searches that combine the chemical substance concepts with biological effects concepts. This file is derived from the Chemical Abstracts Service (CAS) Registry Nomenclature Files and contains records for all CAS Registry Numbers cited in TOXLINE. TOXLINE contains some 200,000 CAS abstracts with CAS Registry Numbers. Steps have been taken to increase the linkage of substance names to CAS Registry Numbers in the other parts of the TOXLINE file. It is expected that by the end of 1975 over 80 percent of the records in the TOXLINE file will contain CAS Registry Numbers. At the present time, CHEMLINE contains records for over 75,000 unique substances. Each record includes, besides the CAS Registry Number, the molecular formula, standardized nomenclature, and synonyms; about 10 percent of the records also contain Wiswesser Line Notations (another method of uniquely identifying chemical compounds). CHEMLINE can be used as a "dictionary" to find a CAS Registry Number, synonyms, or standardized chemical nomenclature for a particular substance, or by searching for name fragments, to identify families of substances that have certain structural features in common. CHEMLINE is available to all TOXLINE, MEDLINE, and CANCERLINE users.

A Toxicological Data Retrieval System

As stated above, TOXLINE is an on-line bibliographic retrieval system based on the scientific literature. A successful search for a toxicological "fact" in TOXLINE will provide the searcher with one or more references to articles that contain or describe this fact. The TOXLINE search usually will not provide the fact itself.

Since on-line bibliographic searching has proven to be successful and highly versatile, it was natural to consider data ("fact") retrieval as a candidate for an on-line interactive system similar to TOXLINE, but containing information about the properties of hazardous chemical compounds to which substantial human populations are exposed. This system, called the Toxicology Data Bank, will have some of the characteristics of a "handbook." Unlike a printed handbook, the data retrieval system will allow the user to coordinate easily attributes of the compounds in any way necessary to answer a particular question.

Information for the Toxicology Data Bank is being extracted from evaluated sources such as textbooks, reviews, criteria documents, and the files of cooperating organizations. The data from these sources are being represented in the Toxicology Data Bank as either numerical values or verbal descriptions, depending on the subject, with the sources clearly identified. Where possible, the descriptions themselves are also indexed using a controlled vocabulary.

Data elements in the Toxicology Data Bank include: substance identification; chemical physical properties; animal toxicology including teratogenesis, mutagenesis, carcinogenesis, and lethal dose values, human toxicology; metabolism; pharmacotherapy; overdose treatment; drug interference; drug interactions; transportation hazards; manufacturing information; and environmental hazards. Users can search the data bank by asking for specific data fields singly or in combination, or by specific data items without identifying the data fields.

The Toxicology Data Bank is being developed using lists of hazardous substances prepared by Federal agencies and other organizations. The Toxicology Study Section of the National Institutes of Health serves as a review group to scan completed data records before they are made available to the public. By the end of 1975, the system will contain about 1,000 compound records.

Interagency Toxicology Information Activities

In December 1973, the HEW Assistant Secretary for Health established a Toxicology Information Subcommittee of the HEW Committee to Coordinate Toxicology and Related Programs. The charter of this Subcommittee states that it should:

> . . . deal with the collection, storage, and dissemination of appropriate data and information with respect to toxicologic and related activities within the Department and indeed beyond the Department. Those who are to use the data and information are best able to identify the need and to establish the mechanisms for management of the information system . . . Managerial and operational control of the toxicology information activities is to be lodged in the Toxicology Information Program of the National Library of Medicine.

Three major projects the Subcommittee plans to begin this year are:

> Laboratory Animal Data Bank—an on-line data retrieval system to facilitate selecting proper animal species and strains for laboratory studies, and the implementation and monitoring of these studies.
>
> Toxicology Document and Data Depository—to be housed within the National Technical Information Service, this planned depository will include toxicological data files that, because of size or other reason, have not been published in scientific journals.
>
> Toxicology Project Information System—a planned quarterly directory of toxicology research-in-progress supported or conducted by Federal agencies, to be extracted from the project files of the Smithsonian Science Information Exchange.

How well has the National Library of Medicine's Toxicology Information Program achieved its goals? The Program has accomplished some important aims and has made a substantial impact on toxicological information handling in this country. Some of the new projects now under way, such as the on-line Toxicology Data Bank, the Laboratory Animal Data Bank, and the Toxicology Document and Data Depository—if successful—will make additional contributions.

The computerized information systems called for by the President's Science Advisory Committee Report now exist or are being built, but the information and data in these systems come almost entirely from the published scientific literature. Few inroads have been made in funneling all the important toxicological information in the files of Government agencies and industrial companies into publicly accessible retrieval systems. However, with the continuing operation of the Toxicology Information Subcommittee and with new legislation such as the Freedom of Information Act, which is opening agency files to public access, the next few years may also bring improvements in these aspects of the Program's activities.

Finally, the potentially adverse effects of chemicals on living systems are common concerns among developed as well as developing countries. Toxicology data banks are being planned and built by other countries, and by international organizations. The Toxicology Information Program is advocating and supporting the coordination of toxicology information activities so that the costly tasks inherent in building these data bases will not be duplicated unnecessarily. In this way, the scarce national and international resources devoted to scientific and technical information handling can be extended through sharing and collaboration.

CHAPTER IV CLASSICAL SERVICES,

Joseph Leiter, Ph.D., Associate Director, Library Operations

MODERN MODES

With the evolution of the Biomedical Communications Network plan in the latter half of the 1960s, the Library Operations component of the National Library of Medicine developed rapidly expanding activities for the entire biomedical community. The two major services, bibliographic retrieval and document delivery provided the bricks; the formation of MEDLARS and its rapid decentralization, followed by the establishment of Regional Medical Libraries, provided the mortar for this evolvement.

Library Operations, the traditional library arm of the National Library of Medicine, can trace its beginnings to the years following the appointment of Dr. Joseph Lovell as the Army Surgeon-General in 1818. The first evidence of a systematic attempt to organize a collection,

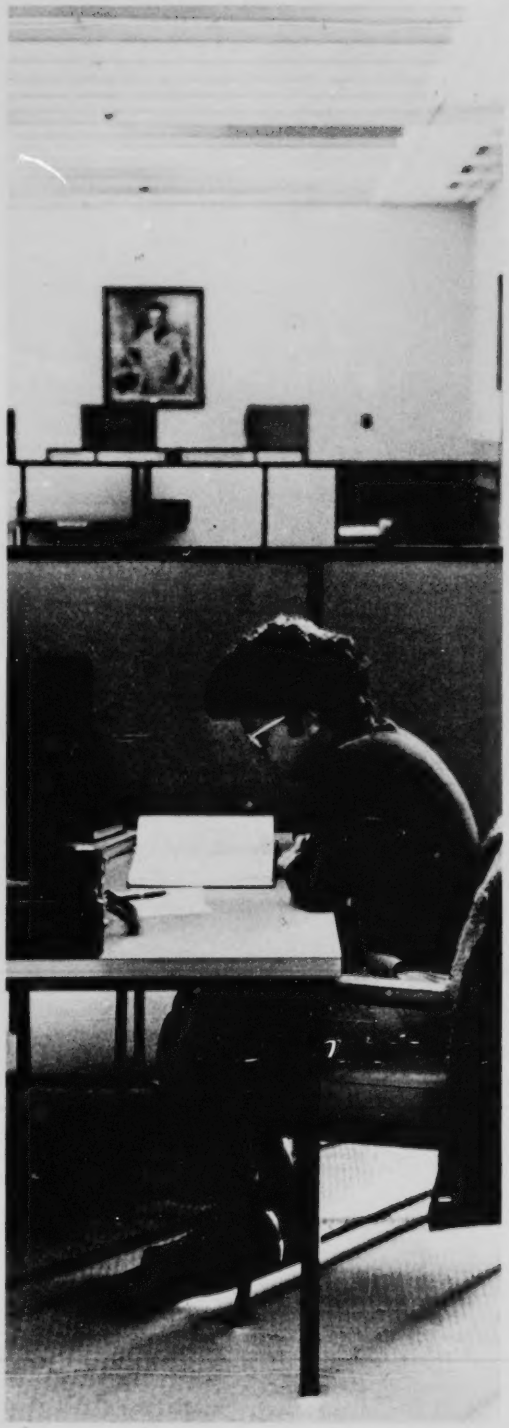
however, was in 1840, during the administration of the new Surgeon-General, Dr. Thomas Lawson, when "A Catalogue of Books in the Library of the Surgeon-General's Office" made its first appearance. This alphabetical listing in manuscript includes about 130 titles and 200 volumes, the entire collection at that time.

In May 1864, the first printed catalog of the Surgeon-General's Library was issued. This catalog was the first known attempt to classify the 1,365 volumes, divided into nine classes, showing the place and date of publication for each item. In October 1865, a second printing listed 2,253 volumes divided into eleven classes.

In 1880 the *Index-Catalogue of the Library of the Surgeon-General's Office, United States Army* was first published. Under the direction of John Shaw Billings, the Library's collection, at that time, had reached 50,000 volumes and 60,000 pamphlets. The first series of the *Index-Catalogue* continued publication under Billings until its completion in 1895. By that time, the collection contained more than 100,000 books and almost 200,000 pamphlets. As described by Scott Adams in Chapter II, the *Index-Catalogue* continued publication through a second, third, fourth, and finally a fifth series covering books printed through 1950, which was completed in 1961.

Prior to the cessation of the *Index-Catalogue*, the first annual *Army Medical Library Author Catalog, 1949* was issued in 1950 and, with the help of the Library of Congress, was published annually. The first quinquennial cumulation of the *Catalog* (1950-54) was published in 1955 in six volumes and contained entries for 180,000 books and serial titles. The name of the publication changed several times, but it continued publication until the beginning of the *National Library of Medicine Current Catalog*, a fully computerized book catalog first produced in 1966.

Over the years, several other events were to have their impact on the *Current Catalog* and the Library's present acquisition policies. Following a survey of the Library in 1943 by the American Library Association, underwritten by the Rockefeller Foundation, the Library issued in 1948 its first preliminary edition of the *Army Medical Library Classification*, an alpha-numeric scheme placing the biomedical literature into broad subject categories. Finally published in 1951, it was revised regularly to acknowledge new trends in medicine. When the National Library of Medicine Act was passed in 1956, the name was changed to the *National Library of Medicine Classification*. It was under this title



that the present (1964) edition was published. A revision of the *National Library of Medicine Classification* is being planned for the coming year. The schedule is used by medical libraries throughout the world and the revision will consolidate all of the changes made to date. It will provide for expansion of existing subject areas, including specialty areas needed by subject specialty libraries, but not necessarily needed or used by the Library.

Almost coincidental with the increase of new terminology and classification caused by the shifting of medical emphasis came the need for revamping the scope and coverage guidelines. On February 8, 1897, Dr. Robert Fletcher in an address at the Army Medical School said "it is of importance in forming a great medical library to avoid loading its shelves with books, which, however valuable in themselves, have not a distinct relation to the purpose of the collection." Following the survey by the American Library Association in 1943 a careful and detailed statement of policy was worked out in 1951 and revised in 1956. In 1969 the National Library of Medicine issued a "Working Paper on the Scope and Coverage of the Collection" as a selection guide. In 1971 a committee composed of senior staff members of the Library and the Director of the National Institutes of Health Library was formed to review the current relevancy of the "Working Paper." The result of these deliberations was a *Scope and Coverage Manual.* The purpose of the *Manual* as stated in the Introduction was "to define the subject fields that are pertinent, to specify the depth of coverage in each, and thus provide selectors and others with a guide for the intelligent choice of material for acquisition." This *Manual* is being used today to guide the collection development efforts of the National Library of Medicine.

Library Operations is composed of four divisions: History of Medicine (see Chapter V), Technical Services, Bibliographic Services, and Reference Services, and the Medical Subject Headings Section. During the past year, substantial efforts were being devoted to shoring up the collection and resources, in order to maintain and continue the greatly expanded back-up support for the archival, network, and other service responsibilities of the Library.

Technical Services

The Technical Services Division is responsible for selecting and acquiring materials for the collection, providing centralized cataloging services to the biomedical library community, binding and repairing materials in the collection, and developing and implementing scope and coverage policies. The work of the Technical Services Division has undergone considerable change since January 1966 when its first issue of a fully computerized book catalog, the *National Library of Medicine Current Catalog,* was published. Before then, the bibliographic files were manual; today, most of them are computerized, with on-line access. That development in 1966 triggered a chain of events that has brought the Division to its present status, for that first publication of the *Current Catalog* increased the demands for faster and more comprehensive acquisitions in order to provide current bibliographic data.

A program was begun to obtain review copies of medical publications from publishers, and another to re-establish blanket order arrangements with foreign dealers. It is interesting to note that the former program closely paralleled one used by Billings, who in the first issue of *Index Medicus,* dated January 31, 1879, wrote, "All books, pamphlets, and periodicals sent by their authors or publishers to the Index Medicus will after record and analysis for the Journal, be placed in the Library of the Surgeon-General's Office." The review copy program was phased out in 1972 in favor of the Division's participation in the Library of Congress' Cataloging-in-Publication Program. This program permits the cataloging of medical titles at the galley proof stage. Cataloging information is then printed in the book at the time of publication, including National Library of Medicine call numbers and MeSH* subject headings. This arrangement led to our present shared cataloging program with the Library of Congress which provides for National Library of Medicine call numbers and MeSH subject headings to be printed on Library of Congress cards for the medical publications acquired.

In 1968 the Division began publishing semiweekly, and in 1975 weekly, proof sheets of *Current Catalog* entries. These contain cataloging data for current English language published materials. Proof sheets are available to the medical library community on subscription from the Medical Library Association.

In 1971 the Library published the computer produced sexennial cumulation (1965-1970) of the *National Library of Medicine Current Catalog.* This cumulation provided medical librarians with the Library's complete store of machine-readable cataloging for the six year period, and represented a complete update of the file to conform to the Anglo-American Cataloging Rules and the 1970 MeSH. In 1974

*Medical Subject Headings

access to the Library's file of machine-readable cataloging was provided on-line through CATLINE (Cataloging On-Line). Accessible through the MEDLINE user network, it provides support for such library activities as cataloging, acquisitions, reference, and interlibrary loan.

In 1972 the Division published a computer produced *Index of NLM Serial Titles*, a keyword-out-of-context (KWOC) index to the approximately 19,000 serial titles then received at the Library. It became a "best seller." Plans are underway to publish a revised edition.

SERLINE (Serials On-Line) became operational in 1973. SERLINE provides direct and immediate access, for all MEDLINE users, to bibliographic and location data for approximately 6,500 substantive serial titles held by 117 resource libraries in the Regional Medical Library Network.

Also in 1973, an on-line Inprocess file (INPROC) and an on-line INVOICE file became operational. INPROC reflects the current status of every item ordered, received, or in the process of being cataloged. INVOICE controls, monitors, and regulates the flow of invoices, and produces regular management reports on the status of items in the file and up-to-date reports on the status of funds expended from the literature budget.

In 1974, under the aegis of the Federal Library Committee, the Division began participating with other Federal libraries in an experiment to assess the usefulness of the Ohio College Library Center (OCLC) system for the Federal library community. Terminals were installed at the Library for on-line access to the Center's data base so that the system could be searched for entries that could not be found at NLM.

A number of new activities were begun in FY 1975. A gaps file containing bibliographic data on journal issues missing from the collection became operational. This file can generate order lists to be used in filling gaps in the collection. It is updated regularly to reflect receipts as well as new missing issues.

Plans for a Master Serials System are underway which include an expansion of SERLINE and its interconnection with a number of other modules so that all of the National Library of Medicine's serial requirements can be satisfied by one unified system. A subscription control file, which will include subscription data for all currently received serial titles as well as the bibliographic data for the non-SERLINE titles, will follow the present gaps file as the next module in building the Master System.

During the year the Technical Services Division began encoding serial entries into the Library of Congress' MARC* format for input into the Ohio College Library Center system for the CONSER** program. CONSER is an effort by the U.S. and Canada to build an on-line international data base for serials in MARC format. A conversion program is now being written at the Library to provide for input of its retrospective records in MARC format into the CONSER data base.

CONSER, OCLC, and the National Serials Data Program all will require continued cooperation with the other two national libraries (Library of Congress and National Agricultural Library) and active participation in the work of the Federal Library Committee. The momentum that has been generated in building national and international bibliographic data bases, and in establishing national and international standards for bibliographic descriptions can only result in increasing demands on the National Library of Medicine to participate in their development.

Bibliographic Services

. . . the practitioner will find the titles of parallels for his anomalous cases, accounts of new remedies, and the latest methods in therapeutics. The teacher will observe what is being written or taught by the masters of his art in all countries. The author will be enabled to add the latest views and cases to his forthcoming work . . .

With these words, *Index Medicus* was launched almost a hundred years ago. Despite the uncanny foresight demonstrated by Dr. Billings so many times, it is doubtful that even he could have imagined, in 1879, the impact that *Index Medicus* would continue to make in 1975. More than 8,000 copies of the bibliography were distributed each month this year—the result of a steady increase in subscriptions since 1891, at which time there were fewer than 500 subscribers.

The production of *Index Medicus* has changed considerably over the years. Far more people are engaged in the preparation of materials for it now, and at the same time the MEDLARS computer and automatic phototypesetter permit larger volumes of data to be processed. As a result, 220,800 articles were indexed during FY 1975, compared with the works of about 4,000 authors in the 1879 issue. One hundred new journals were added to the

* Machine Readable Cataloging

**Conversion of Serial Data Bases

list of those indexed during 1975, bringing the year-end total to 2,353; approximately 800 serials were indexed by Dr. Billings and his staff in the first year. In that year the user of *Index Medicus* was directed to references of interest by approximately 1,300 subject descriptors and cross-references; this number continues to increase, and the user of the 1975 *Index Medicus* is guided by more than 20,000 such terms.

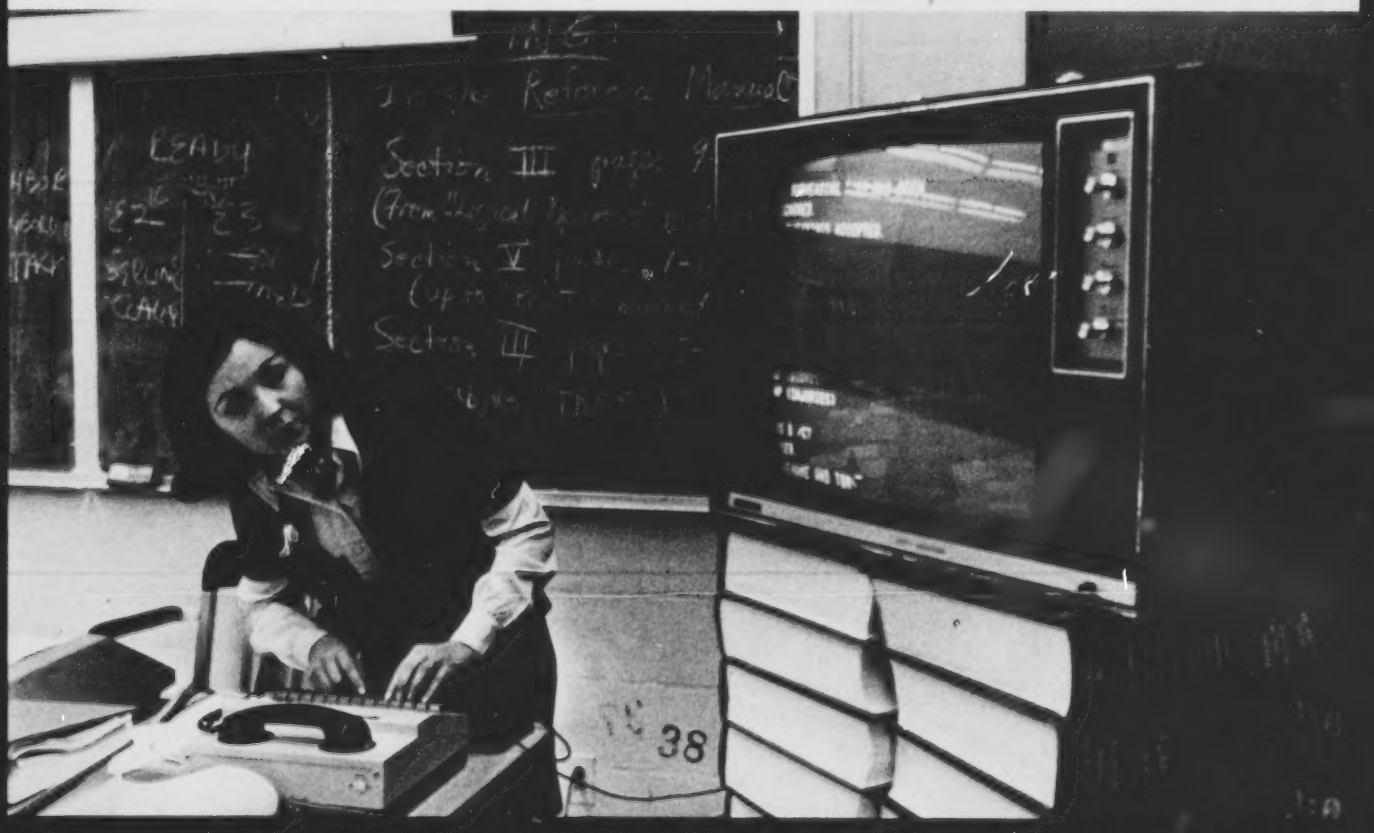
Early issues of *Index Medicus* cited many foreign-language articles, a practice begun by Billings and still considered to be vital to the value of the work as an international reference tool. In keeping with that tradition, half of the material cited during 1975 was in a language other than English. Moreover, 40 percent of the articles cited were indexed on "that side of the water," as Billings put it, as a result of cooperative foreign bilateral agreements formulated by the Library three-quarters of a century after his time.

The Recurring Bibliography program, initiated in 1965 to serve the needs of specialists in discrete subject areas such as cerebrovascular disease, rheumatology, etc., continued to be a valuable service during 1975. A new title was added during the year—*Psychopharmacology Bibliography*—as a cooperative venture between the National Library of Medicine and the National Institute of Mental Health. The total number of such *Index Medicus*-derived publications now stands at 28, not including the popular *Abridged Index Medicus* and the *Bibliography of Medical Reviews*. Each of these special publications is a subset of the computerized MEDLARS data base.

Day-to-day operation of the National Library of Medicine's on-line services network has proceeded smoothly despite troublesome delays caused by the transition to MEDLARS II. Demand for search services continued to rise, and a total of 402,058 searches were performed during the year. Of these, 280,182 were searches done on MEDLINE and related files; searches on TOXLINE, CATLINE, and other data bases accounted for the remainder. Approximately 25 percent of all on-line searches resulted in an off-line computer printout at the request of the searcher; hence, about 100,000 searches (one and a half million pages) were mailed to requesters.

Concentrated training for medical librarians and other information specialists using the MEDLINE service proceeded during the year. Sixty-seven individuals from around the U.S. attended five training courses; each course was of three weeks' duration.

MEDLINE training class.



Several important new directions are being taken for the future. The inclusion of English language author abstracts in the searchable MEDLINE file has already begun; about 10,000 abstracts were added during the latter part of the year. It is anticipated that upwards of 100,000 abstracts will be input each year by FY 1977. Receipt of indexing in machine-readable form from some of the non-U.S. MEDLARS centers is expected to begin during FY 1976. This will not only reduce the amount of in-house keyboarding required, but will make for more efficient handling and transmission of data from abroad.

Closely allied with receipt of machine-readable indexing from abroad is an in-house effort to begin inputting of indexing data on-line. In-house indexers, and others in locations supported by reliable communications services are expected soon to be keying data directly via on-line terminals. Quality review of this indexing will also be possible, with necessary corrections being made by senior indexers (also on-line) prior to release of the citations into the data base.

The Library expects to expand on its production of library service audiovisual teaching aids. Videotapes and slide-tape units prepared to date have been extremely well received by librarians and others wishing to learn more about the NLM's services, and there is a clear need for other such aids.

Medical Subject Headings

Great strides have been made in the area of vocabulary development. The 1975 edition of *Medical Subject Headings* (MeSH) has a number of subject headings in common with those used on the first volume of the *Index-Catalogue*. Under the letter A, the terms Abbatoirs and Abdomen are to be found in both. But over the years, the list of subject headings has changed greatly to accommodate Abate, Abetalipoproteinemia, Abney Virus, and thousands of other concepts not dreamed of when indexing began at the Library.

In 1963, with the advent of the early MEDLARS system called MEDLARS I, computer processing affected the use of the thesaurus terms in significant ways. Whereas one usually refers in a printed index to citations listed under only one term at a time, the computer is able to search millions of citations through the use of logical combinations of many terms, making possible a rapid search that is more responsive and more specific to the user's needs. Innovations in the MEDLARS I MeSH enabled the user to search easily for all citations indexed under a general heading and all specific headings subsumed thereunder in the hierarchically arranged categories of MeSH terms. Nevertheless, certain constraints of MEDLARS I imposed a limitation on the degree of specificity that could be built into MeSH. In the design of MEDLARS II this was recognized, and a system has now been developed to optimize the thesaurus for the needs of users of both our publications and our computer services.

In FY 1975 almost 5,000 new terms were added to MeSH. Citations will appear in the printed *Index Medicus* under only a few hundred of these. Most of the other new headings are highly specific, including many drug and chemical entities and biological taxa. All are available for computer searching. However, for the purpose of listing citations in *Index Medicus* the computer will substitute a pre-assigned general heading for each of these specifics. The more specific terms will be available to the *Index Medicus* user as cross-references, enhancing the user's facility for finding the citations he needs.

A further vocabulary development of note in 1975 has been the expansion of our capability for retrieving all citations having any given word appearing in the title or abstract. This capability is a powerful adjunct to the on-line interactive search system containing citations indexed with MeSH terms. Thus, in 1975 we have entered a new MeSH era, with a thesaurus designed to take full advantage of the power of modern computers without sacrificing the interests of those whose needs are better served by the traditional printed volume.

Reference Services

The Reference Services Division, as one of the principal communication centers of the Library, uses the services and products of the other Library components, both traditional and innovative, to meet patrons' varied needs. Thus, computer-produced journal listings, on-line searches of computer data bases, and teletypewriter interlibrary loan communication go hand in hand with traditional library services. In fact, the history of "information services" antedates the establishment of the Library. As early as 1818 the archives of the U.S. Army Surgeon General's Office show expenditures for medical works which were sent out to surgeons and medical officers in the field. By 1836 the Surgeon General's Office had developed a lively traffic in books. This marked the beginning of a long history of "information service" to individual physicians. Not until September 1, 1957 was

this service replaced by the inauguration of a new loan policy. Instead of lending library materials to individual physicians directly, they are now made available by NLM through another requesting library. The *Annual Report* for 1958 stated: "When the new policy went into effect, it was anticipated that there would be a sizable but temporary decrease in the number of requests received by the Library." The use of the word "temporary" showed great foresight.

A decade later the same could have been said of the beginnings of the Regional Medical Library Network which provided for decentralization of the Library's document delivery service. Requests for interlibrary loans dropped from 160,000 in FY 1968 to a low of 126,000 in 1971. By 1973 requests were back up to 165,000, climbed to 180,000 in 1974, and reached an all time high of 228,755 this past year. In the last half of the year, requests averaged some 21,000 each month or about 1,000 each working day. In spite of staff reductions, the Division has filled 81 percent of the requests accepted; 86 percent of these within four working days.

Last year marked the start-up of an experimental referral system named DOCLINE (Document Delivery On-Line) which utilized Telex to transmit selected unfilled interlibrary loan requests to the British Library Lending Division in Boston Spa, England. Begun as an experiment, DOCLINE has now developed successfully into the first phase of a computer-based interlibrary loan verification, routing, and management information system. At present, requests for referral are fed into the Library's computer which is accessed by the British Library Lending Division. The requests are then transmitted electronically to that Division. During the next few years automatic interregional routing of referrals as well as referrals between the National Library of Medicine and major libraries abroad, will be developed. DOCLINE will interface with the Library's serial locator file (SERLINE) and file of catalog data (CATLINE) permitting development of hierarchical routing and bibliographic verification.

Reference inquiries reached a new peak this year with 29,406 requests for reference assistance received by mail, telephone, and in person (Table 11). In the aggregate, 320,079 requests, probably the greatest demand in the Library's history, were made to the Division this year for retrieval of material from the general collection for both on- and off-site site use (Table 10).

The Division took the lead in an effort to hire handicapped persons for temporary positions under special authorities. In every case these staff members proved to be strongly motivated and their work was of high quality. Three handicapped persons on temporary appointments applied for and were selected to fill permanent positions. All have become valued members of the Library staff.

In addition to its responsibilities to acquire and make available the world's biomedical literature, the Library also has the responsibility to preserve this material. This function is accomplished through micropreservation, the conversion of deteriorating portions of the collection to microfilm form. By 1964, 37 million pages of the Library's collection were considered deteriorated, and this figure was expected to reach 262 million by 1989. Beginning in 1966, through a combination of filming within the Library and filming by outside contractors, an expanded program of

Photocopy being processed for interlibrary loan.

micropreservation was initiated. Over the past ten years, approximately 18 million pages of deteriorating material have been converted to archival microfilm (the equivalent of about 25,000 volumes) and added to the Library's film archives. In FY 1975 over 1.5 million pages were microfilmed, almost half of it filmed by the Library staff as material too brittle to be sent out to a contractor.

Prior to the Library's centennial celebration in 1936, the Librarian's report to the Surgeon General assessed his storage problem this way: "Everywhere you go, every dark cubby-hole that is opened up in the basement, shows stacks and stacks of books and periodicals rising to the ceiling, the shelves groaning and bent under the weight, and really the confusion is indescribable . . . The lack of space is an absolutely pressing immediate thing, which will not only not wait, but is a condition that has already existed far too long."

Today we must report that without additional shelf space, best estimates indicate that stacks for the journal collection will be filled to capacity by 1980. To alleviate the situation, plans were completed toward the close of the year for installation of motorized compact shelving in three bays of the C level stack area (seldom requested materials). This sytem of stack ranges, controlled by electric motors and rolling on rails, eliminates all but one aisle for every ten ranges, and will almost double the capacity of the area.

For the Reference Services Division, the public service function remains the same; the thrust for the future is to improve the tools and techniques for performing that function.

Table 4. Growth of Collections, FY 1975

	Volumes Added	*Total Volumes in Collection*
Book Material		
Bound Monographs		
Prior to 1800	360	40,070
1801-1913	441	91,028
1914-present	7,056	276,952
Bound issues	36,428	475,457
Unbound issues	586	48,642
Theses	(-59,707)*	280,878
Pamphlets	32	172,021
Total Book Material	(-14,804)*	1,365,048
Nonbook Material		
Microfilms (archival)	1,908	19,428
Microfiche	-	6,648
Pictures	762	70,765
Total Nonbook Material	2,670	96,841
Total Book and Nonbook Material	(-12,134)*	1,481,889

*Almost 60,000 theses were withdrawn from the collection during FY 1975

Table 5. Summary of Acquisition Statistics

	FY 1973	*FY 1974*	*FY 1975*
Serial Record			
New titles added	741	960	990
Discontinued titles	86	105	404
Current titles received	23,787	24,642	25,228
Publications Processed			
Serial pieces	100,930	93,371	137,180
Other	20,548	16,148	21,553
Total	121,478	109,519	158,733
Obligations for Publications	$575,000	$689,740	$723,571
Included for rare books	118,133	101,769	82,136

Table 6. Summary of Cataloging Activities

	FY 1973	*FY 1974*	*FY 1975*
Completed cataloging	13,161	11,382	12,844
Catalog cards filed	112,716	134,190	118,463
Volumes shelf-listed	9,494	9,900	11,843

Table 7. Binding Statistics

	FY 1973	FY 1974	FY 1975
Number of Volumes			
Send to binder	32,362	31,900	38,178
Obligations for binding	$114,787	$110,595	$136,409

Table 8. Summary of Bibliographic Services

	FY 73	FY 74	FY 75
Articles Indexed			
NLM	30,894	44,100	49,492
Other U.S.	74,276	74,001	98,701
Foreign	102,646	106,217	72,607
Total	207,816	224,318	220,800
Recurring Bibliographies	24	24	28
Journals Indexed for Index Medicus	2,194	2,275	2,353

Table 9. Summary of On-Line Services

	FY 73	FY 74	FY 75
Searches:			
MEDLINE	141,730	178,983	232,623
SDILINE	13,363	27,646	45,285
CATLINE	1,601	45,771	86,890
SERLINE	477	2,880	2,094
TOXLINE	6,000	13,000	14,728
CHEMLINE	-	-	8,611
CANCERLINE	-	-	1,909
AVLINE	-	-	285
BACKFILES*	1,651	10,138	9,633
Total	164,822	278,418	402,058
Off-Line Prints:			
MEDLINE	40,115	40,924	52,851
SDILINE	5,865	13,866	15,506
CATLINE	9	382	536
SERLINE	-	134	102
TOXLINE	-	1,034	6,507
CHEMLINE	-	-	64
CANCERLINE	-	-	373
AVLINE	-	-	15
BACKFILES*	1,611	11,143	21,370
STORED SEARCH	-	-	3,315
Total	47,600	67,483	100,639

*Includes BACK69, BACK72, MEDFILE, and COMPFILE.

Table 10. Summary of Circulation Activities

	FY 1973	FY 1974	FY 1975
Number of Requests Received	256,715	262,733	320,079
For Interlibrary Loan	165,247	179,747	228,755
For Readers	91,468	82,986	91,324
Number of Requests Filled	194,341	205,894	247,614
For Interlibrary Loan	123,911	138,999	173,642
Photocopy	114,228	126,689	158,493
Original	9,683	12,310	15,149
For Readers	70,430	66,895	73,972
Number of Requests Unfilled	62,374	56,839	72,465
Interlibrary Loan	41,336	40,748	55,113
Rejected	12,228	7,521	15,446
Referred	NA	6,561	6,645
Returned as unavailable	29,108	26,666	33,022
Reader Service returned as unavailable	21,038	16,091	17,352

Table 11. Summary of Reference Services

	FY 1973	FY 1974	FY 1975
Requests by telephone	11,803	13,316	11,509
Government	4,507	5,397	4,028
Nongovernment	7,296	7,919	7,481
Requests by mail	1,229	1,398	1,488
Government	63	200	385
Nongovernment	1,166	1,198	1,103
Readers assisted	11,107	12,594	16,409
Government	3,207	4,307	4,718
Nongovernment	7,900	8,287	11,691
Total	24,139	27,308	29,406
Government	7,777	9,904	9,131
Nongovernment	16,362	17,404	20,275
Reading room users registered	16,938	15,209	22,426

CHAPTER V A LIBRARY WITHIN THE LIBRARY—

Asklepios, god of medicine (with staff), and Telesphoros, a lesser healing god sometimes associated with him.

THE HISTORY OF MEDICINE COLLECTIONS

John B. Blake, Ph.D., Chief, History of Medicine Division

The History of Medicine Division is often called "a library within the library," and with some justification. Within its area of responsibility—books and journals to 1870, manuscripts and oral history materials, and fine prints and photographs—the History of Medicine Division carries out all of the traditional library functions of acquisition, cataloging, reference, and what is nowadays called "document delivery." Like other areas of the Library, the Division also serves national bibliographic needs through the publication of catalogs and indexes and serves as a back-up library of medical historical materials for the nation.

In other respects, however, the designation of the historical collection as a "library within the library" may lead to a misconception of its purpose and activities. It may suggest to some that it is a thing set apart rather than an active functioning center of library work. The holdings of historical source material constitute a national treasure. The History of Medicine Division has many rare and valuable books. Yet it holds them, not as jewels to be admired through the glass windows of heavily guarded locked cases, but as the accumulated record of the health sciences and professions, to be used by scholars seeking knowledge of the past so that we may better understand the present and strive for a more enlightened future. The collections of the History of Medicine Division, like the more recent literature and newer educational media available elsewhere in the Library, are here to serve the needs of the nation, not as a group of museum specimens to be marveled at, but as a research resource to be used. The library is the historian's laboratory, without which he can no more operate than can the bacteriologist without his Petri dishes.

During the past fiscal year, the History of Medicine Division supplied nearly 9,000 reader requests for books and journals and sent out some 2,200 items on special order or through interlibrary loan, usually in the form of photocopy. The ability thus to serve research needs of scholars around the country depends on many factors, but none is more crucial than the foresight of our predecessors who over more than 100 years have built a great library.

Arabic Manuscript by al-Razi dealing with gastrointestinal diseases; oldest work in the Library (1094).

The present historical collection of the National Library of Medicine originates from a time in 1816 when the Surgeon General of the Army, Joseph Lovell, purchased the first books of reference for his small office—perhaps with his own money, for across the title pages of some still in the Library today he wrote his name and rank. Over the years Lovell and his successors gradually added more books by purchase and gift. When the Library's first handwritten catalog was prepared in 1840 it contained hardly more than 200 volumes. Not until the Civil War did the rate of expansion increase, necessitated by the heavy wartime demands placed on the medical department and by research needs at the newly created Army Medical Museum. After the Civil War, care of the Library fell into the hands of John Shaw Billings, who was determined that there should be one place within the country where a physician could find all the literature of medicine. With the assistance of fellow officers acting as book scouts and of the many friends he made through correspondence, Billings collected medical literature at an unprecedented rate, turning the Surgeon General's Office Library, within a decade, into a true national medical library. The journals, books, reports, and pamphlets he collected before his retirement in 1895 form the basis of what are now the historical collections. Partly this has come through the natural process of aging: what Billings acquired as current literature is historical literature now. But Billings also acquired older books as well, for he had a strong sense of the value of medical history and demonstrated his interest and competence in many of his writings.

Though hampered often by too little money and a lack of continuity in the post of director, most of Billings' successors continued to add in a modest way to the Library's historical resources of older books and journals. In recent years it has been possible to continue this practice and also to expand the horizons of the historical collection in some degree to correspond with the broadening outlook of the health sciences generally and the newer demands of historical research. The Library has been able to add seventeen incunabula during the last decade and significant classics such as the first edition of Robert Burton's *The Anatomy of Melancholy* as well as filling in gaps in the writings of lesser known men whose works are nonetheless essential for understanding the past. Today, the History of Medicine Division holds over 70,000 imprints of the 18th century and earlier and perhaps three times that number printed from 1801-1870.

During the past fiscal year, significant or typical acquisitions included *Recentiorum disceptationes de motu cordis*, Leyden, 1647, containing the sixth printing of William Harvey's great work; three 17th century works on "political arithmetic" by William Petty, a key figure in the early history of vital statistics; a collection of over 600 16th, 17th, and 18th century dissertations in psychiatry and related fields; a rare edition of Galen's *De ossibus ad tyrones*, Padua, 1551; and Johann Wier's psychiatric classic, *De praestigiis daemonum*, in an early French translation. Other acquisitions included works by such authors as Xavier Bichat, Robert Boyle, William Cullen, Konrad Gesner, Albrecht von Haller, Friedrich Hoffmann, and John Howard.

Of particular interest in the bicentennial year was the acquisition of a rare pamphlet, *Directions for Preserving the Health of Soldiers*, written by America's most famous physician of the Revolutionary era, Benjamin Rush, and printed in Lancaster, Pennsylvania, in 1778 by direction of the Board of War. Rush recommended a sound diet, temperance, cleanliness, and regular exercise. Calling upon officers to promote the health of those under their commands, he reminded them that "your country and posterity look up to you for the preservation of the only means of establishing the liberties of America."

Manuscripts and Oral History

Medicine is a discipline which traditionally has relied on the printed word for its authoritative sources. Credit for a discovery in medicine is generally allocated to whoever published it first. Similarly medical historians have and still do rely primarily on printed sources to trace the development of medical ideas, for printed works have represented the available body of medical knowledge. Increasingly, however, medical historians interested in the growth of institutions, the development of a researcher's thought, or the relations of medicine and society have turned to manuscript sources for a more comprehensive understanding of the subject than can often be found in the public record. For this reason the History of Medicine Division has given greater attention in recent years to acquiring and preserving for the benefit of scholars the recent unpublished records that will be essential for future historical research.

Since the days of John Shaw Billings, the Library has acquired occasional manuscripts, usually in book form. In addition to a number of early western codices and a significant group of Arabic texts—including the Li-

brary's oldest volume—the manuscripts collection includes items from France, Germany, and other European countries. The bulk of the older material pertains to 18th and early 19th century American and British medicine. Lecture notes written by students of John Hunter, Sir Astley Paston Cooper, and Percivall Pott stand on the shelves beside those of Benjamin Rush, William Shippen, and Daniel Drake. A number of 18th century medical recipe books give a realistic picture of therapy. The manuscripts collection is particularly rich in materials pertaining to military medicine, in part because of the Library's long association with the Office of the Surgeon General of the Army. Numerous diaries, collections of correspondence, and official medical reports are available from most of the major military conflicts from the Revolution through World War I.

In the 1960s a separate manuscripts section was established in the History of Medicine Division and a trained librarian employed to catalog the Library's collection according to accepted modern standards. Simultaneously an active acquisitions policy was initiated and further professional staff made available to assist in the development of the manuscripts program. Today the modern manuscripts collection has over 700 individual collections ranging in size from single items to some eighty manuscript boxes, and it continues to grow by the acquisition of unusual and important materials. Collections acquired as gifts far exceed the occasional items, generally from the 19th century or earlier, that are purchased. Selected individuals who have made significant contributions to contemporary medicine or whose personal papers contribute to an understanding of modern

Anatomical theatre at Altdorf, Germany. Seventeenth-century engraving.

medical history are encouraged to deposit their papers in the National Library of Medicine. In recent years the collection has been enriched through the addition of the papers of such important medical figures as Stanhope Bayne-Jones, Henry Nelson Harkins, Alan Gregg, William B. Bean, Ward Darley, Chauncey Leake, and William S. Middleton. The archives of a number of professional organizations and societies are also preserved in the Library's collection, including the National League for Nursing, the Association of Military Surgeons, the American Clinical and Climatological Association, and Alpha Omega Alpha Honor Medical Society.

Interesting acquisitions during the past year have included the papers of Chevalier Jackson and Lawrence Kolb. To the older material was added the journal of Assistant Surgeon John L. Fox, assigned to the *USS Vincennes* under the command of Lt. Charles Wilkes on the famous exploring expedition to the South Pacific and Antarctica in 1838-42.

At the same time that the Library's program to acquire modern manuscripts was getting under way, attention was also directed to the preparation of oral history materials consisting of tape recorded and transcribed interviews with contemporary figures. From 1966 to the present, the Library has acquired 519 hours of oral history materials, including 140 interviews, most of which are included in the 10,880 pages of transcript. About one fifth has resulted from interviews conducted by Peter Olch, M.D., the one staff member available for this program. The remaining material has been acquired through contract with other interviewers, as gifts, or from the other oral history programs.

The oral history interviews in the collection cover a wide area of medicine and vary in length from one to 35 hours. Among the longer ones are those with Stanhope Bayne-Jones, Albert Baird Hastings, William S. Middleton, Shields Warren, Emile Holman, and Owen H. Wangensteen. The most frequently consulted oral history collection is the series of 83 interviews conducted by Dr. Milton Senn in connection with a history of the child development movement in the United States.

Prints and Photographs Collection

The Library's print collection originated in 1879 with the acquisition of a large group of portraits by John Shaw Billings. Subsequently the collection was enlarged by the addition of many types of graphic media including woodcuts, engravings, etchings, lithographs, and photographs, as well as a number of drawings, watercolors, and oils. They range in age from 15th century woodcuts to photographs of contemporary medical scenes and figures and include fine prints dealing with medical topics by artists of such diverse styles as Albrecht Dürer, Käthe Kollwitz, Ben Shahn, and Norman Rockwell. In addition to some 30,000 individual portraits, there are many pictures of medical institutions, including schools, hospitals, and laboratories. Over 600 of the finest prints in the collection are caricatures, many beautifully hand-colored, from the 18th and 19th centuries. Numerous pictures from 19th century periodicals document early equipment and medical techniques.

The collection, now totaling over 60,000 items, continues to grow through purchase, gift, or transfer from other government agencies. During the past year 762 pictures were added and some 1800 photographs and slides provided to scholars, book publishers, magazine editors, television producers, and other patrons.

Publications

With its steady enlargement in recent decades, the Library has had an expanding responsibility to provide users with finding guides to the various kinds of invaluable historical as well as current literature in its collections. A number of such special publications have been prepared since 1950. In that year there appeared *A Catalogue of Incunabula and Manuscripts in the Army Medical Library*, by Dorothy M. Schullian and Francis E. Sommer. In 1961 the Library issued *Early American Medical Imprints: A Guide to Works Printed in the United States 1668-1820*, by Robert B. Austin. This was followed in 1967 by *Medical Reference Works 1679-1966: A Selected Bibliography*, edited by John B. Blake and Charles Roos, published by the Medical Library Association.

The year 1967 likewise marked the publication of *A Catalogue of Sixteenth Century Printed Books in the National Library of Medicine*, compiled by Richard J. Durling. Later acquisitions of early printed works were similarly described in a supplement to this work compiled by Peter Krivatsy and published in 1971. Staff members are now working on a comparable catalog of the Library's rich holdings of 17th century printed medical books, as well as on a short-title catalog of its large 18th century collection, nearly 40 per cent of which is not

represented in the *Index-Catalogue* or other published guides to the Library's holdings.

Since 1965, History of Medicine Division staff members have compiled detailed indexes to the voluminous current secondary literature pertaining to the history of medicine. From these, the *Bibliography of the History of Medicine* is issued annually, with a cumulative volume published every fifth year. Issue number 8, for material published in 1972, appeared during the past year. The Division also prepares or assists with the compilation of smaller sized catalogs in connection with various historical exhibits at the Library. The staff have collaborated in historical publication projects of such outside related organizations as the Oral History Association and the American Association for the History of Medicine.

Table 12. History of Medicine Activities

	FY 1973	FY 1974	FY 1975
Acquisitions			
Books	936	1,142	863
Modern manuscripts	13,819	42,970	89,563
Oral history hours	52	40	98
Prints and photographs	1,100	565	762
Processing			
Titles cataloged	2,192	2,473	2,866
Modern manuscripts cataloged	45,890	20,000	59,355
Pictures indexed	526	355	404
Articles indexed	4,270	5,354	4,236
Pages microfilmed	160,220	148,952	151,130
Public service			
Reference questions answered	1,936	1,865	1,880
ILL and pay orders filled	2,140	2,233	2,214
Reader requests filled	6,278	4,085	8,962
Pictures supplied	1,782	1,877	1,797

Reading Room – History of Medicine Division.

Physician-Patriots: Four Signers of the Declaration of Independence

Among the 56 signers of the Declaration of Independence were four practicing physicians—two famous for their work in medicine, Rush and Bartlett, and two who were better known for their political activities, Hall and Thornton. (A fifth signer, Oliver Wolcott, studied medicine for a time but never practiced.) Benjamin Rush—whose system of bleeding in the treatment for yellow fever was denounced as "one of the great discoveries . . . which have contributed to the depopulation of the earth"—was probably the best-known American physician of his day, and despite some of his mistaken theories, made outstanding contributions in his field. Josiah Bartlett's career was primarily in public affairs, but he was a notable physician as well and founder of the New Hampshire Medical Society. Lyman Hall and Matthew Thornton also practiced medicine, but most of their energy was devoted to careers as statesmen.

Benjamin Rush (1745-1813)

Benjamin Rush (1745-1813), despite his mistaken view that "depletion" through bleeding and purging was the one treatment for most diseases, made many important contributions to American medicine and social reform. He established the first free dispensary in the country, was probably the first to advocate the study of veterinary medicine, made notable contributions to psychiatry, and was the first medical man in the country to achieve a general literary reputation. Although a controversial figure in his medical theories, he was greatly admired as a teacher, having taught about 3,000 students in his lifetime. A major result of his instruction was the emergence of Philadelphia as the leading American center of medical training during the first half of the nineteenth century. [Engraving by Louis Le Met from the History of Medicine Division, NLM.]

Josiah Bartlett (1729-1795) was a notable physician, and chief justice and governor of New Hampshire. The first to vote for adoption of the Declaration of Independence, he was one of the most influential members of the two Continental Congresses in which he served. His interest in the medical profession did not abate during his long career in public affairs, and in 1791 he secured from the state legislature a charter for the New Hampshire Medical Society.

Lyman Hall (1724-1790) began his career as a preacher in Connecticut, but he later abandoned this in favor of the study and practice of medicine. He moved with a group of New England Congregationalists to Georgia, where he practiced medicine before becoming a delegate to the Continental Congress. After the war, he returned to Georgia to practice medicine, where he was elected governor in 1783.

Matthew Thornton (c. 1714-1803) was born in Ireland and emigrated to America about 1718. He began to practice medicine in Londonderry, New Hampshire, in 1740, and was an "under-surgeon" in the New Hampshire militia under the royal government. Prominent in the agitation against the Stamp Act, he was later elected president of the provincial congress of 1775. He was also chairman of the committee of safety that organized resistance and exercised general powers of government during the early stages of the war. He never returned to the practice of medicine, but devoted most of his remaining years to political affairs in New Hampshire.

CHAPTER VI OUTSIDE OUR WALLS—

Clinical librarian project at the University of Connecticut (far right) and construction of the library at the Southern College of Optometry (below) received NLM grant assistance.

THE EXTRAMURAL PROGRAMS

Ernest M. Allen, Sc.D., Associate Director, Extramural Programs

Since 1965 the National Library of Medicine's interactions with the health science libraries of the U.S. have gone far beyond the traditional role in acquiring and indexing the biomedical literature. In the mid-sixties medical libraries and biomedical communications in general in this country were in a state of disrepair. The unprecedented increases in health activities in the 1950s and the early 1960s, the accelerated growth rate of medical research, and the rapid advance of interdisciplinary effort precipitated a critical period for scientific communication. In 1960 a report prepared for the Senate Appropriations Committee stated: "One urgent need almost all medical schools have in common is the improvement of their libraries, which are essential to the functions of education, research, and good medical care."

Financial support had not kept pace with the increased information demands. The quality of research and patient care was threatened. For years librarians had lamented the adverse effect of their poorly supported institutions. Finally, in the mid-sixties, the voices of physicians and scientists joined them in a plea for support. On April 3, 1964, the National Advisory Health Council passed a strong resolution urging prompt and effective remedial action for this problem. In 1965 the

President's Commission on Heart Disease, Cancer, and Stroke reported that the disrepair of the medical library system constituted a major weakness in both Federal and private medical programs. The Commission recommended specific programs to strengthen this alarmingly weak link, noting that libraries are interwoven into the basic fabric of research, teaching, and practice in a manner indispensable to progress, and that adequate library resources are essential to the nation's health efforts. The National Library of Medicine was designed as the logical point for planning, developing, and managing these programs. The Commission recommended to the President that the Department of Health, Education, and Welfare propose broadly conceived and adequately funded legislation which would authorize the National Library of Medicine to undertake extramural functions designed to assist the nation's medical libraries and to develop new and improved communication systems. The Commission recommended that this program be supported by an appropriation of not less than $150 million over the next five years, and that grants and contracts to improve medical facilities, resources, personnel, and secondary publications be awarded. The Library was encouraged to conduct forward-looking research to increase the effectiveness of medical library service throughout the nation.

The Commission stressed the urgent need for long-range planning for an effective network and noted that existing library resources were grossly inadequate for the purpose. It reported that in 1963 and 1964 the National Library of Medicine had a budget of less than $1 million for extramural programs for support of medical libraries in educational and research institutions, hospitals, and other private nonprofit health organizations. In contrast, it described as desperate the need for working and stack space in the more than 4,000 medical libraries maintained by health and medical institutions. A survey of needs of 130 medical facilities had revealed a deficiency of 3,200,000 square feet of space for libraries and known dollar construction needs of $128 million.

By September 1965, both the Senate and the House of Representatives had proposed new legislation to amend the Public Health Service Act to provide adequate medical library services and facilities. Experts who testified before Congressional Committees in 1965 indicated repeatedly that medical libraries were ill housed, understaffed, and inadequately stocked with books, journals, and other resources, and that they were functioning with antiquated procedures and technologies.

The new Director of the National Library of Medicine, Martin M. Cummings, M.D., in summarizing his 1965 testimony before the House Committee on Interstate and Foreign Commerce expressed his conviction that the provisions of the proposed Medical Library Assistance Act would go far toward solving the serious and most urgent medical communications problem which existed. He said, "We are most hopeful that upgrading our nation's medical library network will prove to serve the interests of medical education, medical research, and practice, which is the ultimate response to the health needs of our nation."

The Medical Library Assistance Act of 1965 (Public Law 89-291) authorized a program of grants to finance construction of medical libraries, train biomedical librarians and other information specialists, provide for the expansion and improvement of medical library resources, stimulate research and development in medical library sciences, support biomedical publications, and establish regional medical libraries. A retrospective view of the program points up substantial benefits which have been gained for medical libraries through the seven grant programs of the original act and its subsequent revisions (Tables 13, 14, and 15).

Construction

The original Act authorized $10 million for each year, 1967-1970. During this period, the Library provided construction grants totaling $11.25 million to assist 11 libraries associated with schools of health sciences. Under the 1971 Extension Act, the yearly authorizations were increased but no funds were appropriated. In 1974 Congress repealed the construction authority.

Resource and Service Improvement

The Resource Grant Program is one of the most important components of the Medical Library Assistance Act. Although much was still unknown in 1965 about the status and specific needs of the nation's health libraries, it was estimated that more than $100 million would be required to bring the resources of these libraries up to recommended strength. The Resource Grant Program could not attempt to meet this total need, nor was this its intention. In the first five years of the legislation, less than $12 million was made available. During this same period the volume of health information continued to expand

rapidly; the cost of informational materials rose sharply; and as new programs in health care, research, and education were created, there was a considerable increase in the demand for library services.

The Resource Grant Program was conceived as "self-help" to supplement and stimulate an increase in private support. Originally, the purpose was to improve library service through the acquisition of resources. To accomplish this goal the law provided a formula system of grants in which the initial award was based on previous library expenditures. In addition, an "impact philosophy" was adopted in which priority funding would go to libraries serving the largest number of people. Considering the formula structure of the grant and the philosophy of funding priority, it is obvious that a majority of funds went to the larger medical school libraries since these had the largest base of institutional support and served the largest number of users. In spite of the limitation of the formula approach, the program had a substantial impact with more than 400 libraries receiving support of almost $12 million.

By 1970, when the Medical Library Assistance Act was renewed and amended, considerably more was known about the health science library population. The time had arrived to transfer emphasis to programs of service improvement and to provide a stimulus for the "have-not" libraries—those which could not participate in the original program. To accomplish these goals the Resource Improvement Grant and the Resource Project Grant Programs were established.

The purpose of the Improvement Grant was to establish libraries where need existed and to assist the smaller health-oriented institutions in acquiring the necessary materials, particularly books and journals, to serve the immediate and basic requirements of primary users. The Improvement Grant is a one-year award for a maximum of $3,000. A prerequisite for applying is a commitment by the applicant that adequate space and at least a half-time individual responsible for the library will be provided. These assurances are certainly not insignificant when the costs of space and part-time staff are related to the amount of the Improvement Grant. Since FY 1971, when this type of grant first became available, nearly 400 awards have been made. The program has been successful because it has stimulated growth in budget and staff support for the applicant libraries.

The second type of resource support, the Resource Project Grant, is intended to stimulate established libraries to emphasize new, expanded, or improved services and to act as adjuncts to the resources provided and maintained through local efforts. It is a way of helping a medical library with the start-up costs of a new medical library service. As with the Improvement Grant, an important criterion for review of the Project Grant proposal is the plan for the post-grant continuation of the project.

The types of activities funded with the Project Grant mechanism are varied. Since it is not financially feasible for each medical library to acquire all health science information, various kinds of cooperative efforts are being explored. One method by which small hospital libraries can stretch their information dollar is to form a consortium for the sharing of resources. An example of such a cooperative effort is a group of community hospitals in suburban Boston that have formed, with the assistance of a Resource Project Grant, a Consortium for Information Resources to plan, develop, and evaluate coordinated information resources.

Learning Resource Centers are being established in libraries with grant assistance. Such centers contain audiovisual materials, computer-assisted instruction programs, self-teaching modules, and a number of other diverse educational technologies. Funds were awarded to the College of Medicine and Dentistry in New Jersey to create an audiovisual center to serve not only the faculty and students of the College but also the health professionals throughout the entire Region II of the Regional Medical Library system.

Projects have also been funded to develop automated systems for library technical services. For example, at the University of California, Los Angeles, various aspects of the library's operations, such as the serial record, have been automated and the software packages developed there have been adapted by other institutions.

Both types of Resource Grant are considered an integral part of the Regional Medical Library system. The basic philosophy of this system is resource sharing and the Resource program is supportive of this concept.

Regional Medical Libraries

The Regional Medical Library system is a network of the health science libraries throughout the country. It is a means of assisting health researchers, educators, practitioners, and students, at all levels and in all health disciplines, with their information needs. There are 11 regions, each administered

by a Regional Medical Library.

The model for the network is hierarchical, with each higher-level facility acting as the primary source of information material to the echelon below. The foundation of the network is the "basic unit" level, predominantly the libraries of the nation's hospitals, which are the primary entry points into the network for the majority of health workers. The next level in the hierarchical chain consists of 125 "resource libraries"—those institutions with more comprehensive informational resources that can be shared with institutions at the basic unit level. Usually these are medical school libraries. The backup facility for these participating resource libraries within each region is the next level in the system, the Regional Medical Library. As each region's primary health information source, the Regional Medical Library has the additional responsibility for planning a coordinated system of library services within the region. The fourth level, the backup resource for the Regional Medical Libraries and the total library network is the National Library of Medicine.

The concept of a national interactive Regional Medical Library network was developed in response to trends which began to surface in the early 1960s. The National Library of Medicine and its advisors were then creating programs which were significant departures from the traditional archival role of national libraries.

Although medical libraries had already established a reputation for coordination and sharing, they had no organized arena within which the full potential of this beneficial practice could be realized. Consequently, confronted with requests for new and increased services, libraries began to turn more and more to the source which was identified by the Congress as the "libraries' library." Thus, there began to develop a dependency on the National Library of Medicine, a dependency which might have led to the evolution of a monolithic medical library resource and information system. This growing dependency, if permitted to continue, could only have eventually accelerated the deterioration of information services and local information centers. As an alternative to a monolithic national system, the National Library of Medicine committed itself to the development of a network of libraries which would extend, not only to the major professional society and medical school libraries, but even to the "doctor's reading room" in a small rural hospital.

In 1964 a Presidential Commission recommended that "a legislative proposal should be developed and enacted providing for the

THE REGIONAL MEDICAL LIBRARY NETWORK

support and stimulation of a National Medical Libraries Network." The Commission concluded that an important solution to the inadequacies of scientific communications was a flexible, network-based program of planning, stimulation, and coordination "to assure all areas and all medical schools, scientists, and practitioners of the benefit of effective access to all medical data and information." In October 1965 the Medical Library Assistance Act authorized a program of grants for the establishment of Regional Medical Libraries.

Given the unknowns in our information about existing resources and services, initial planning, both nationally and regionally, was a difficult task. The Library sought and received assistance from the Association of American Medical Colleges, the American Hospital Association, the Medical Library Association, and other groups and persons representing the sources and users of health science information. The program was initiated in October 1967, when the first Regional Medical Library grant was awarded to the Countway Library of Medicine in Boston. Almost three years after the first grant, in July 1970, another award to complete the establishment of the geographic network was made to the Health Science Library of the University of Nebraska Medical Center in Omaha. Thus, including the National Library of Medicine, which serves as Regional Medical Library for the Mid-Atlantic states, there are now 11 Regional Medical Libraries covering all 50 states.

Each Regional Medical Library provides network management and coordination of information services within the region and participates with other Regional Medical Libraries and with the National Library of Medicine in planning for an interactive cooperating network. The basic philosophy of the Regional Medical Library system is resource sharing. In order to advance this concept on a national basis, emphasis is placed on developing a program of coordinated information services which will be responsive to user needs as determined by a continuing assessment of these needs. A key element in the success of these efforts is an interinstitutional commitment for the effective and efficient utilization of major resources. This common commitment requires an examination and a rational resolution of the issues of cooperative acquisitions and cooperative technical services. Current planning involves the rechanneling of the fiscal resources of libraries into activities which facilitate cooperative development.

Since the Regional Medical Library program is designed to support health care delivery, education, and research, planning must begin with identifying the needs of the community, and must provide an administrative structure and decision-making process which are responsive to those needs. Assuming that these goals are attained, any legitimate health enterprise in the region should be able to look to the Regional Medical Library as its information arm and feel confident that its views will get careful consideration in the decision-making process.

Research and Demonstration

Research, development, and demonstration grants are a significant portion of the medical library assistance program. Research support has been concerned primarily with the fields and specialties of the health information process. It was recognized that critical needs for better access to information by the national health community required basic research and technical development. While new processes, techniques, and methods needed investigation, it also became clear that successful work had to become part of the general information system fairly quickly. Accordingly, with renewal of legislation in 1970 and 1974, the Congress added authority for demonstration projects so that the benefits of new methods could be exhibited in actual operating situations.

Project to link a medical library (University of Cincinnati) with patient care areas was supported by NLM grant.

Members of the National Library of Medicine peer review groups conducted two conferences, in October 1974 and May 1975, to discuss current trends in information science research. The suggestions and advice from these conferences helped to establish research goals for the future. In the next few years more attention will be focused on the utilization of the computer in the information sciences. At these conferences, the members emphasized the need for health practitioners to retrieve actual information rather than references to documents. Recent developments which enhance computer power make an information-providing capability feasible, but more work remains to be done. Speakers at the conferences agreed that better understanding of decision-making processes and means by which those processes could be augmented and improved through computer assistance might yield considerable returns in improved patient-care and health education.

In the years from 1966 through 1974, the National Library of Medicine awarded $8,677,000 for 105 separate research projects. During 1975, 11 new projects were begun with total awards of $1,315,000. Significant projects include an operations research study at the Houston Academy of Medicine - Texas Medical Center Library and a project at the University of Minnesota to explore and adapt the minicomputer to medical library operations.

Training

Collecting and disseminating information and documents requires highly qualified personnel. Since 1966, more than $8.2 million has been made available for the training of 558 medical librarians, information specialists, and medical historians.

Twelve programs concentrated solely on training over 270 medical librarians—both postgraduate internship and master's degree programs. Achievements of these programs may be measured in part by the number of highly qualified graduates, many of whom have attained key leadership positions such as heads of university health science center libraries. Recent studies have shown that graduates of Library-supported internship programs have been significantly more active in enterprises involving the application of automatic data processing, computers and computer programing, and library administration. Such graduates are more likely to participate in research and development activities than other library school graduates.

A second area of manpower need was for biomedical information personnel to assist on-going scientific research. One training project, at Stanford University, supported interdisciplinary graduate education in information systems research. Another program at the University of Nebraska concentrated on training audiovisual information specialists and biomedical communication specialists. Such programs have had an impact on the educational technology used by medical schools as they have developed and expanded in the last decade.

After 1971 the shortage of medical librarians decreased noticeably and grant funds to support specific training in medical librarianship were no longer necessary. In 1974 the Library decided to concentrate on training health professionals in computer science applications to medicine. Eight new projects have been initiated in this area, and in the present academic year (1975-76) 63 students are enrolled.

Special Scientific Projects

Special Scientific Projects are awarded to health professionals and scientists (and to public or nonprofit private institutions on their behalf) for compiling existing, or writing original, contributions on scientific, social, or cultural advancements in health-related disciplines. A need for such scholarly activity had been expressed by the Board of Regents many times prior to 1965 and this interest was reconfirmed in 1972 and 1973. The intent of the legislation is to enable the National Library of Medicine to assist the serious inquirer who needs authoritative, complete, and documented information on a major health area. Unfortunately, the relevant information is often scattered among a great number of papers, journals, reports, and monographs. It is difficult to consolidate the literature and to interpret reports that are often confusing and sometimes even contradictory. Eminent health scientists or clinicians, who find scholarly research and writing congenial, are encouraged to apply their talents to interpreting recorded knowledge on broad health topics.

In 1972 the Board of Regents evaluated the program in terms of accomplishments, legislative basis, and underlying intent. The need still exists for major definitive studies on

Minicomputer project supported by grant at the University of Minnesota.

health. Since then, seven Special Scientific Projects have begun. They range from a definitive work on the causes and treatment of infectious diseases in humans, by Dr. Wesley Spink, Emeritus Regents Professor of Medicine at the University of Minnesota, to an analysis and interpretation of the worldwide literature on malignancies occurring in the generative system or resulting from the reproductive process, by Dr. Roy Hertz, Professor of Medicine at George Washington University.

Publications

In addition to the authority afforded by the Medical Library Assistance Act of 1965 and its extensions, the Library uses the authority provided by Section 301 of the Public Health Service Act to support publications. This is the general authority for research and investigation, including authorization to "collect and make available through publications and other appropriate means" information relating to the "causes, diagnosis, treatment, control, and prevention of physical and mental diseases and impairments of man."

Since its inception in 1966, the program has grown to include support for preparing and publishing critical reviews and monographs in health fields, publications in library and information science and in biomedical communications; pilot support for health-related journals with innovative approaches; studies in the history of medicine; translations of current foreign biomedical monographs; scientifically significant conference proceedings; and secondary literature tools in the health sciences, such as atlases, catalogs, and bibliographies. A total of 125 grants in the amount of $5,461,193 have been made since the start of the Publication Grant Program.

The largest number of publication projects activated over the past ten-year period was for secondary literature tools. Among the more noteworthy of these are Kenneth S. Warren's

Schistosomiasis: The Evolution of a Medical Literature: Selected Abstracts and Citations, 1852-1972, Margaret D. Dayhoff's *Atlas of Protein Sequence and Structure*, D.R. Swindler and C.D. Wood's *Atlas of Primate Gross Anatomy*, and B.H. Waksman's *Atlas of Experimental Immunobiology and Immunopathology*.

Next in number of awards were studies in the history of medicine, which have included publications ranging from the three volumes of Dr. Rudolph E. Siegel on Galenic medicine to articles on medicine among Indian tribes in Oklahoma.

An analysis of the Publication Grant Program completed during FY 1975 showed that the average length of grant support per project was 2.3 years; 37 percent were awarded for only one year. University presses have been the most frequent publishing outlet for Library publication projects, but scientific societies, professional journals, and commercial presses have also published the results of supported projects.

During FY 1975 emphasis shifted from secondary literature tools to critical reviews or biomedical monographs which identify the present status of research or practice in various health fields. Examples of supported publications received during FY 1975 included the multi-authored *Community Medicine in Developing Countries* and the *Review of Allied Health Education: I*. A total of 40 publication grants was funded during the year, of which 19 are new awards.

A revised "Guidelines for the NLM Publication Grant Program" was approved during 1975 by the Library's Board of Regents. Priority is to be given to small grants and to projects requiring only publication assistance.

Table 13. Medical Library Assistance Act History

Title	*Programs Authorized*	*Fiscal Years*
Medical Library Assistance Act of 1965 Public Law 89-291	Construction Training Special Scientific Projects Research Publications Resource Regional Medical Libraries	1966-1970
Medical Library Assistance Extension Act of 1970 Public Law 91-212	Same programs	1971-1973
Health Programs Extension Act of 1973 Public Law 93-45	Same programs except construction authority not extended	1974
Health Services Research, Health Statistics, and Medical Libraries Act of 1974 Public Law 93-353	Same programs except construction authority deleted	1975-1976

Table 14. Grant Awards 1966 - 1975

Program	*Number*	*Amount*
Construction	11	$11,250,000
Training	137	9,253,000
Special Scientific Projects	26	632,000
Research	325	10,003,000
Publications	198	4,585,000
Resource	2,588	22,916,000
Regional Medical Library*	81	15,993,000
Totals	3,366	$74,632,000

*Includes funding by contract

Table 15. Grant Awards FY 1975

Program	*Number of Awards*	*Amount Awarded*
Training	10	$ 939,000
Special Scientific Projects	4	145,000
Research	18	1,327,000
Publications	39	672,000
Resource	66	1,420,000
Regional Medical Library*	8	2,194,000
Totals	145	$6,697,000

*Funding by contract.

CHAPTER VII A NATIONAL RESOURCE

Among the MEDLARS partners around the globe, from left: Canada, Great Britain, Japan, and Australia.

WITH GLOBAL IMPACT

Mary E. Corning, Assistant Director, International Programs

When I say 'Our Medical Literature', it is not with reference to that of any particular country or nation, but to that which is the common property of the educated physicians of the world . . . the literature which forms the intra- and international bond of the medical profession of all civilized countries . . .

John Shaw Billings*

In the early stages of the National Library of Medicine there was a strong interest in developing relationships with institutions abroad. In his preparation of the *Index-Catalogue* and the *Index Medicus*, John Shaw Billings sought and collected biomedical literature published throughout the world. In 1881 Army Surgeon General Barnes commissioned Dr. Billings to visit a number of libraries on the European continent in order to initiate exchange programs.

*John Shaw Billings: *Our Medical Literature*, *Transactions of the International Medical Congress*, (7th) London (1881).

MEDLARS Cooperation

The amount of material acquired by the Library since those early days has now increased to more than 20,000 biomedical periodicals annually, with approximately 64 percent non-U.S. From this massive amount of material the National Library of Medicine has selected, with the aid of consultants, 2300 biomedical journals which form the corpus of our computerized activity, MEDLARS/MEDLINE, and our published *Index Medicus*. Because of the international character of this literature, the Library has received many non-U.S. requests for the MEDLARS data base or for the services originating from it. Such requests were received even before the system became operational in 1964, and often from a number of institutions in the same country, all wishing to be designated as a MEDLARS Center.

A primary and continuing Library decision throughout the years has been that any international arrangements relating to the MEDLARS system should be based on substantive technical cooperation. Initial informal discussions which were held with officials in the professional communities of the United Kingdom and Sweden in 1965 resulted in an experimental project. The United Kingdom and Sweden wished to utilize an existing operational system to develop biomedical information services; and the National Library of Medicine was eager to have an independent technical assessment of MEDLARS performance in other countries. Arrangements were made with the Office for Scientific and Technical Information, Department of Education and Science in the United Kingdom and with the Medical Research Council and the Karolinska Institutet in Sweden. The National Library of Medicine provided magnetic tapes, technical documentation, and training programs. The participating countries agreed to provide evaluation and technical feedback. The U.K. began to provide services in 1966 and Sweden in 1967.

As Sweden and the U.K. moved from this experimental phase to operational status, it was evident that this informal, cooperative arrangement should become more definitive. In 1968 these working relationships became *quid-pro-quo* bilateral agreements between the Library and the United Kingdom and Sweden. They represented a sharing of time, talent, and resources with no transfer of funds. In return for access to MEDLARS the participating country agreed to provide: MEDLARS services to its biomedical community; a document support service; indexed input to MEDLARS; and to pay for personnel sent to NLM for training in indexing and searching.

These initial agreements served as models for future arrangements and identified technical criteria which assisted other countries in determining their readiness and the Library's response. The Library would receive and evaluate a country's proposal in terms of: the non-U.S. institution's technical, personnel, and financial resources and capabilities; the intended use of MEDLARS to meet foreign biomedical information needs; and the input which the participating foreign institution could make to the MEDLARS data base.

Increased interest in the National Library of Medicine and its computer data base was evident within the Organization for Economic Cooperation and Development (OECD). The setting for discussions on cooperation in information then became multilateral instead of bilateral. The Library participated in these deliberations in the spirit of international collaboration, and agreed to explore whether one additional center in Europe could be established with a consortium of OECD countries. From 1967 to 1969 discussions for the further internationalization of MEDLARS within OECD continued. Both the United Kingdom and Sweden offered trial services and expressed a willingness to serve a regional area, if desired.

These deliberations resulted in no agreement among OECD member countries, but stimulated renewed individual requests for national centers. Accordingly, in 1970, France, the Federal Republic of Germany, Australia, and Canada each became a bilateral partner with the Library. In 1972 Japan and the World Health Organization entered into similar arrangements.

In 1974 and 1975, with the development of MEDLARS II and the extension of the Tymshare network internationally, there were three alternatives for MEDLARS cooperation with NLM: MEDLARS tapes, tapes plus the NLM software searching package, or on-line access to the Library's computer in Bethesda. The selections made by our cooperating partners are as follows:

Tapes	Germany, Japan
Tapes and software	Australia, Sweden
On-line to NLM	Canada, France, WHO
Tapes and on-line to NLM	United Kingdom

Sweden now is providing on-line services to Scandinavia from the Biomedical Documentation Center at the Karolinska Institutet. The Pan American Health Organization is in an experimental trial period and is not yet a participant in a full *quid-pro-quo* arrangement.

The administrative setting for these MEDLARS centers varies from country to country. The National Library of Medicine has maintained a policy of requiring the participating country to select the institution from among the many who have requested to be a MEDLARS center. Thus, the MEDLARS center may be in an organization which is primarily concerned with medicine or health, or a library, or an organization devoted broadly to science and technology (Table 16). In each case, however, the center has been given a national mandate to serve the country.

The pattern of regional coverage by the non-U.S. centers is an important and delicate policy issue. The National Library of Medi-

Top: G. Falkenberg, M.D., Director, Medical Information Center (Sweden).

Below: P. Dostatni, M.D., Search Analyst, INSERM (France).

Un réseau international de centres MEDLARS a été constitué depuis 1965.
L'IMA EST LE CENTRE FRANÇAIS
RESEAU DES CENTRES MEDLARS
à une demande de recherche bibliographique.
MEDLINE contient actuellement plus de 400 000 références d'articles.
200 terminaux (écrans cathodiques, teletypes) sont utilisés dans les bibliothèques médicales, instituts de recherche et hôpitaux aux Etats-Unis.
Cette démonstration permet, par une liaison directe avec les U.S.A. l'interrogation sur le mode conversationnel du fichier MEDLINE.
LIAISON PAR CABLE SOUS-MARIN
USA
ORDINATEUR TYMSHARE
NATIONAL LIBRARY OF MEDICINE WASHINGTON IBM 370-155

TABLE 16. Non-U.S. Medlars Centers

Country	Operating Organization	Parent/Funding Organization
Australia	The National Library of Australia (NLA)	
Canada	National Science Library (NSL)*	National Research Council of Canada
France	Institut National de la Santé et de la Recherche Médicale (INSERM)	Ministère de la Santé Publique et de la Sécurité Sociale
Japan	Japan Information Center of Science and Technology (JICST)	Science and Technology Agency
Sweden	Karolinska Institutet	The Swedish Medical Research Council
United Kingdom	The British Library	
West Germany	Deutsches Institut für medizinische Dokumentation und Information (DIMDI)	Der Bundesminister für Jugend, Familie und Gesundheit
Intergovernmental Health Organization	World Health Organization (WHO)	

**Renamed Canada Institute for Scientific and Technical Information, October, 1974.*

cine does not determine for other countries how and to what extent each may extend services beyond national boundaries. The decision is made jointly by the participating countries, but with the knowledge and consent of the National Library of Medicine. The extension of MEDLARS information services depends on a country's relationship with neighboring countries, its pricing policy for MEDLARS services, and a determination of whether the relationship is restricted to service or involves a broader area of technical assistance. The Library has been referring requests for new centers to our current partners, with the understanding that an information service pattern may be developed. In the event that this is not possible, other direct arrangements with the Library may be considered.

It was envisaged that a unique role could be performed by the World Health Organization in providing service not only to its technical staff and Commissions but to the developing countries that would receive information not available under other mechanisms of national auspices. WHO is in the early phases of this activity.

All of the bilateral arrangements were renegotiated this year to reflect the MEDLARS II developments. A meeting of the International MEDLARS Policy Advisory Committee will be held in November 1975. This will be the third such meeting of Policy Officials, accompanied by the Directors of the MEDLARS Centers. It will reexamine the cooperative efforts, operational experience, regional coverage, networking, the availability of TOXLINE, and future collaboration.

TABLE 17. Types of Public Law 480 Projects Active in FY 1975

Type	*Number*
1. Critical review monographs	64
2. Secondary literature tools	1
3. Library and Information Science	2
4. Periodicals	1
5. Histories of medicine	12
6. Foreign translations	16
7. Conference proceedings	5
8. Multi-category agreements	9
TOTAL	110

Exchange Programs

Through the years the Library has developed a large number of cooperative exchanges. These now number 895 exchange partners in 85 countries. The cooperative exchange is a mechanism for acquiring medical literature which may not be otherwise readily obtained. The program has been under review this year to ensure that there is an equivalence to the material being exchanged.

The People's Republic of China is now an integral part of this exchange program. The Library receives five Chinese medical journals. This is in contrast to the 91 Chinese journals, including 30 major medical periodicals, which had been published and received prior to 1966.

AID Services

The Library continues to provide services to developing countries under a special arrangement with the U.S. Agency for International Development. About 20,000 such services are provided each year to 48 developing countries throughout the world. The geographic distribution is estimated to be 29 percent to Latin America, 60.8 percent to the Near East, 8.3 percent to the Far East and 1.9 percent to Africa. This assistance responds to a demonstrated need in countries where there are insufficient medical literature resources. The services include interlibrary loans, reference requests, MEDLINE searches, loan of audiovisual materials, and subscriptions to *Index Medicus* and *Abridged Index Medicus*. Many aspects of medical research, education, public health, and preventive medicine are encompassed in these services. The level of activity made possible by this NLM/AID agreement, however, does not respond totally to all needs of the developing nations.

World Health Organization Library.

Public Law 480 Programs

The Special Foreign Currency Program is the oldest of the extramural activities and is dependent on the expenditure of U.S.-owned local foreign currencies in selected countries. Legislative authority for this program derives from a 1958 amendment to the Agricultural Trade Development and Assistance Act of 1954 (Public Law 83-480), as amended. Under Section 104(b) (3) of this Act, the Public Health Service is authorized to: "Collect, collate, translate, abstract, and disseminate scientific and technological information and conduct research and support scientific activities overseas . . ." The Library serves as the Department of Health, Education, and Welfare's principal resource for the improvement of the international exchange of biomedical information.

The Library assumed responsibility for the National Institutes of Health-Russian scientific translation program in 1962-63. It then consisted primarily of translating biomedical literature from the Union of Soviet Socialist Republics, Poland, and Yugoslavia to make it more available to U.S. scientists. A series of Russian monographs were translated into English in Israel. Poland and Yugoslavia undertook the preparation and publication of English language editions of ten Polish and three Yugoslavian biomedical journals. During this period, the scientific and technical aspects of these Special Foreign Currency Programs were the responsibility of the National Library of Medicine, but the administrative arrangements were handled by the National Science Foundation in accordance with an earlier agreement.

During FY 1965 the Library renegotiated this agreement to permit independent NLM program activity with its own managerial, program, and administrative channels for PL 480 funded projects in biomedical communications. The Library then began to broaden the scope of its activities to include specialized abstracts and digests, works on medical history, and critical reviews. Two early exploratory projects were in the field of drug information—one at the request of the Surgeon General and the other in cooperation with the Food and Drug Administration. The Library also initiated in 1964 a cooperative effort with the National Institute of Dental Research, the Division of Dental Public Health, and the American Dental Association to utilize special Israeli expertise in dentistry; and the first comprehensive abstract service of the world's scientific literature in oral health was begun. This publication, *Oral Research Abstracts*, continues today as a self-sustaining effort of the American Dental Association.

The Special Foreign Currency Program was evaluated in 1965 by a distinguished ad hoc group which encouraged the Library to develop a program of critical reviews. These reviews would represent an intellectual analysis of the past, present, and future of particular specialty fields. The review program was formally established in 1966 with awards for three critical reviews to be undertaken in Poland. An agreement was also negotiated in Israel with the Editorial Board of the *Israel Journal of Medical Sciences*, which assumed responsibility not only for identifying potential authors but for reviewing proposals before submission to the Library.

To date, 86 projects totaling $1,300,000 (in equivalent foreign currencies) have been activated under this program in Israel. In 1971 the Library entered into a similar PL 480 agreement with the Coordinating Commission for Polish-American Scientific Collaboration; 21 projects in Poland have been activated to date under this program.

Within the last few years the cover-to-cover translation program has been completely phased out because its utility had diminished. By the early 1970s the shortage of special foreign currencies available to Federal agencies led to a gradual curtailment of PL 480 projects in some countries. In Israel, the first to be affected, the establishment in 1972 of the U.S.-Israel Binational Science Foundation made it possible for the Library's collaborative programs with both the *Israel Journal of Medical Sciences* and the Israel Program for Scientific Translations to continue under awards from the new Foundation.

About $10,000,000 equivalent in foreign currencies of seven countries has been obligated to date for the over-all program. At present, the Library sponsors projects in Poland, Israel, Yugoslavia, Tunisia, Egypt, India, and Pakistan, including analytic critical reviews and biomedical monographs, histories of medicine, secondary literature tools in the health sciences (such as guides, atlases, handbooks), translation of current and historical foreign biomedical monographs, and proceedings of international conferences. There is collaboration with major U.S. scientific societies, both to determine the need for studies in special biomedical areas and to arrange for distribution in the United States. University presses and professional societies, as well as the National Technical Information Service, are utilized in the dissemination of studies funded under the Library's PL 480 program.

Alexandra Hossman, M.D., indexing at DIMDI (Germany).

During FY 1975 the Library's Special Foreign Currency Program numbered 110 active projects in the seven participating countries, of which 10 were new projects (Table 17). About 70 percent of the program (primarily critical reviews) is prepared in Poland and Israel, with the remainder (largely translations) carried out in Tunisia, Egypt, India, and Pakistan. During FY 1975 16 publications resulting from PL 480 support were received. (For a complete list see Appendix 2).

Foreign Visitors

The Library receives more than 1,000 visitors annually from other countries—physicians, medical librarians, and information specialists. In furthering the exchange of information and ideas, the Library arranges special programs for these visitors consistent with their professional responsibilities. Of concern to the many visitors to the Library were topics such as the concept of a national biomedical information resource; specialized information activities in cancer, cardiovascular diseases, and toxicology; health care; and computer aided instruction. There were also a number of study teams including groups from Japan, Sweden, Pakistan, Germany, Algeria, USSR, Iran, Mexico, Trinidad and Tobago, and Egypt.

In January 1975 Dr. O.K. Harlem was appointed as a Visiting Scientist at the National Library of Medicine for one year. Dr. Harlem is a specialist in pediatrics, has been a general practitioner, a hospital physician, a university teacher, and an editor. Dr. Harlem's contributions are in both the substance of medicine and in the communications and publication of biomedical information. He will draw upon his breadth of experience to develop a monograph during his stay at the National Library of Medicine which will form the basis of a course in biomedical communications within a medical school curriculum.

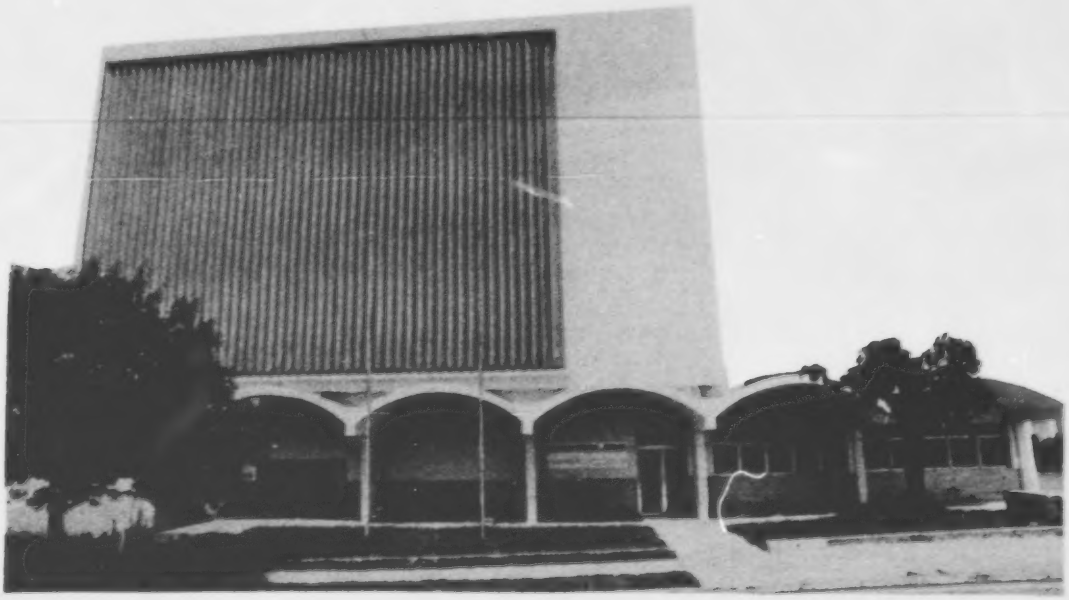
National Biomedical Information Centers

The National Library of Medicine, functioning as a national biomedical information resource, has attracted the interest of a number of governments who have expressed interest in establishing national biomedical information centers. The Library does try to assist on a technical consultation basis. Although it does not provide foreign fellowships or have a formal training program, it is responsive to requests for the specialized training of physicians and information specialists who have been designated to direct a national information activity in their own country.

Two specific arrangements have been developed with Egypt and Iran. In October 1974 the Assistant Secretary for Health, HEW, and the Minister of Health of Egypt held a U.S.-Egyptian Joint Working Group meeting on Medical Cooperation. As a direct result of this meeting, the Chairman of the Board of Regents and the Library's Assistant Director for International Programs met with Egyptian officials to discuss potential collaboration in biomedical information. In July 1975 the second meeting of the full Joint Working Group met in Washington, D.C., at which time the Assistant Secretary, HEW, and the Minister of Health of Egypt agreed that both parties recognize that biomedical information is a necessary component of biomedical research, education, and the delivery of health services. It was also agreed to explore cooperative arrangements which will result in improved biomedical communications between and within both countries. In particular, experiences will be shared which relate to the development of a national biomedical information resource and an operational national medical library system.

At the request of the Minister of Science and Higher Education of Iran, the Assistant Director for International Programs served as a consultant to Iran to assist in the planning of a national medical library and also in determining what bilateral cooperative relationships could be developed between the Imperial Medical Center of Iran and the U.S. National Library of Medicine. As a result, Iran is in the early stages of developing a National Medical Library and Information Resource. On May 12, 1975 the Director of the National Library of Medicine and the Minister of Science and Higher Education of Iran signed a Memorandum of Understanding under which

Pan American Health Organization Regional Library of Medicine (BIREME).



the Library will provide technical consultation, training, and specialized services requested and funded by Iran.

Regional Programs for Biomedical Information

The regional approach taken by the Pan American Health Organization (PAHO) in its establishment of a Regional Library of Medicine (BIREME) in Sao Paulo, Brazil in 1967 has resulted in an effective operational activity. The National Library of Medicine serves as a technical consultant and backstop to PAHO and BIREME.

Since its first full year of operation in 1969, the collection of the Regional Library has been strengthened and the staff has increased both in number and in professional expertise. BIREME has performed 218,000 loan services; prepared 5255 special bibliographies; obtained and donated 266,000 journal issues to other Latin libraries and has provided specialized training to 263 Latin health science librarians.

As a result of the meeting of the Latin American Ministers in 1972, PAHO and BIREME have entered into agreements with Argentina, Peru, Chile, Colombia, Uruguay, and Venezuela. Each of these countries is in the process of establishing a national center so that the transmittal of services can be channeled between these centers and BIREME. However, considerable effort is still needed to strengthen these national entities and crystallize their relationships into effective service linkages.

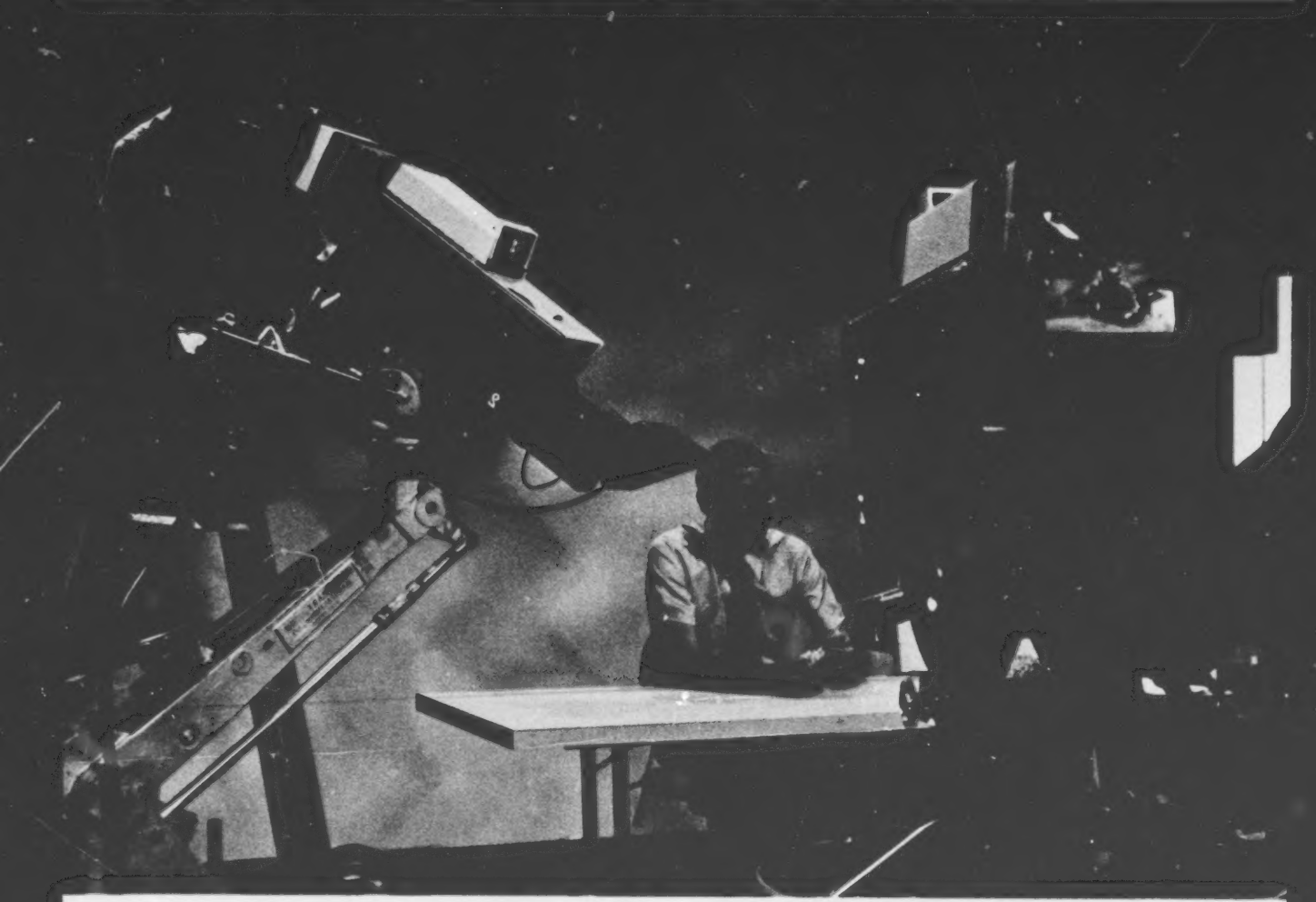
The success of this PAHO undertaking has demonstrated that, even with political constraints and economic considerations, it is possible to cross boundaries with a regional /international effort devoted to the substance of biomedicine and the provision of information services. It is a recognition that improved biomedical communications will assist in the advancement of medical research, education, and ultimately health care.

The World Health Organization has been interested in developing such regional approaches in other areas of the world. To date, no formal step has been taken.

International Organizations

The National Library of Medicine has continued its membership in the International Council of Scientific Unions Abstracting Board (ICSU AB) and participates in the deliberations of this organization. The organization is a meeting ground for information and abstracting organizations, private and governmental, from a number of countries throughout the world, including the United Kingdom, France, Germany, Poland, Japan, South Africa, Canada, Belgium, The Netherlands, and the USSR. Important topics under consideration by ICSU AB are standardization, the economics of primary and secondary publications, the relationships between primary and secondary services, and the information needs of developing countries. The Assistant Director for International Programs represented the Director at the 1974 Berlin meeting of ICSU AB and presented a paper on "The Effect of Copyright on Information Dissemination," and at the 1975 Brussels meeting presented a paper on "Biomedical Information a la Carte." The 1976 meeting of ICSU AB will be hosted by the National Library of Medicine in Bethesda.

CHAPTER VIII NOT BY PRINT ALONE—



Videotaping session at the National Medical Audiovisual Center in Atlanta.

AUDIOVISUAL SERVICES FOR HEALTH SCIENCE EDUCATION

George E. Mitchell, D.M.D.,
Director, National Medical Audiovisual Center

The National Medical Audiovisual Center, a component of the National Library of Medicine since 1967, is dedicated to the communication of health sciences information through developing and distributing effective learning materials. Its energies are focused on assisting in the undergraduate education of health professionals and, more recently, extending its services to continuing education in partnership with the Library's Lister Hill National Center for Biomedical Communications. The Audiovisual Center had its beginning early in World War II when a program of malaria control in war areas was established in Atlanta, Georgia. This program provided training for scientists and technicians needed for a massive malaria eradication effort in the southeastern United States. Starting modestly with one cameraman/director, a program of motion picture training films was undertaken to document such typical activities as dynamiting, ditchdigging, spraying, and larviciding.

From this malaria control program evolved the Communicable Disease Center (CDC), with a broader mission in the detection, prevention, and control of infectious disease. As CDC grew, its audiovisual support activities were expanded. By 1949, the scope of audiovisual production led to the creation of a division to provide audiovisual materials for

all agencies of the Public Health Service. When CDC moved into its new multibuilding complex near Emory University in 1960, the Production Division was renamed the Medical Audiovisual Branch and housed in a modern facility designed and equipped for a wide variety of audiovisual development and distribution activities.

Three years later, the branch was renamed the Public Health Service Audiovisual Facility with responsibility to "serve as the focal point for the production, utilization, and distribution of all audiovisual forms in support of the mission of the Public Health Service and allied governmental organizations." The facility continued to provide audiovisual support and services to all programs of CDC.

This dual role was maintained until its reorganization and designation in 1967 as the National Medical Audiovisual Center of the National Library of Medicine. In 1970 the Center moved to enhance and strengthen the informational and educational services of the Library by expanding its programs in nonprint media including a clearinghouse of information on instructional materials, evaluation and acquisition, distribution, advisory services, training workshops, applied research, and instructional media development projects.

In July 1971 the National Library of Medicine and the Bureau of Health Manpower Education of the Department of Health, Education, and Welfare agreed to establish an Office of Audiovisual Educational Development—recently renamed the Learning Resources Program, Bureau of Health Manpower, at the Center. Under this plan, the Center contributes its staff and facilities for audiovisual development and distribution, training, consultation, and other assistance to medical institutions. The Bureau of Health Manpower furnishes such resources as grant programs, demonstration projects, and student assistance. The Learning Resources Program reviews and implements education and training grants and contract proposals, and coordinates many joint intramural activities of the Bureau and the Library.

The National Medical Audiovisual Center is concentrating on a national program to improve the use and effectiveness of learning materials in schools of the health sciences. The major programs and projects include the activities discussed below.

Clearinghouse

In FY 1975 the Center continued to host and participate in peer review panels convened to screen and evaluate medical teaching materials. This review process provides input for the Library's data base known as AVLINE

(Audiovisuals On-Line). The AVLINE clearinghouse system is designed to provide information on audiovisual materials in a format similar to the MEDLINE system. This is of value to the teacher searching for validated audiovisual instructional materials acceptable for student self-instruction or in support of lectures and other learning experiences.

Surveys of materials in use at schools of the health sciences, conducted by the Association of American Medical Colleges, the American Association of Dental Schools, and the Center, have identified about 22,000 items for possible review. As of the end of the fiscal year, 29 panels had reviewed 4,364 educational items. Of these, 2,590 were deemed suitable for inclusion in AVLINE and 368 were rated by the panelists as "highly recommended." The audiovisuals in this latter category are the principal source for the Center's materials acquisition program.

The peer review process is planned as a long-range, continuing program. In addition to providing a central data base for audiovisual teaching materials and identifying those which are most appropriate for national distribution, it will ultimately help to identify areas in which development of additional educational materials is needed.

On May 1, 1975, the AVLINE test data base was released to 31 U.S. medical institutions. The test base contains about 250 references to materials related to the nervous system. After the on-line retrieval system is tested, it will be released nationwide starting with a data base of about 900 citations.

Educational Research and Evaluation

A new emphasis on research and evaluation was begun during the first half of FY 1975 with the creation of the Educational Research and Evaluation Branch. This branch is responsible for developing, implementing, and measuring the effectiveness of applied research projects involving the use of audiovisual media and educational methodology in health sciences education.

One example of an applied research project asks the question: How may we derive a rule of thumb method for defining critical content of learning packages and identify those testing elements essential to measuring learner performance? This would help distinguish performance related "must know" from "need to know" information in learning packages. Another example is that of setting up field testing of learning packages using a cross-sectional national audience of students. This is to determine learning effectiveness independent of any particular local conditions for instruction. These data would be of great value upon entry into the AVLINE data file of evaluated learning packages, adding the most important criteria of all—the results of student tryouts.

Acquisition and Distribution

During the past year the Center's distribution program acquired 105 new audiovisual teaching packages for the collection, while 141 packages were withdrawn. The new acquisitions represent about 13 percent of the total loan collection stressing continuing efforts to upgrade learning materials available to the health sciences community. In this reporting period, the direct services program received and processed about 62,000 requests for audiovisuals and shipped 51,000 films, 2,250 duplicate videotapes, and 4,800 duplicate audiotapes in response to these requests. The development of a pilot program for videocassette loans has been completed, and distribution is scheduled to begin next year.

In 1973 a Sales Program was begun in cooperation with the National Audiovisual Center, General Services Administration. Under this program, eight self-instructional teaching packages were placed for sale through the National Audiovisual Center's Government Film Sales Program. The second year's operation added 22 new teaching packages to the collection. During this year, 35 new self-instructional teaching packages were completed and added to the Sales Program. This collection of titles covers the following disciplines: anatomy, gastroenterology, mammography, ophthalmology, pathology, pediatrics, pulmonary diseases, radiology, pulmonary surgery, and veterinary medicine. Next year, about 72 new instructional packages will be placed in the Sales Program. New subjects to be included will be: physiology, tissue culture, anesthesiology, cardiology, nursing, and dentistry.

Workshops and Conferences

One of the Center's most effective means for reaching health educators is through workshops and conferences focused on the development of learning packages. The Center's training program attracted more than 650 participants in 18 workshop sessions in FY 1975. Examples of topics: criterion test development, management of learning resources, learning spaces design, and basic principles of media management.

The Center conducted a comprehensive course for the training of regional media consultants which was jointly planned and sponsored by the National Library of Medicine and the Medical Library Association. Eleven trainees selected from the staffs of libraries in the Regional Medical Library Program were given instruction in media selection, development, and evaluation, the organization and management of media collections, and selecting and operating various items of audiovisual equipment.

The Center's staff participated in workshops held at the University of California (Davis), the New Jersey College of Medicine and Dentistry, a meeting of the New York Nurses Association in Brooklyn, the United States Military Academy, the Upstate New York Regional Medical Library Association in Syracuse, the Mid-Atlantic Regional Medical Library Association Meeting at Rutgers University, the Chicago Dental Society's midwinter meeting, and the Dental Science Club of Washington, D.C.

Advisory Services

The Center offers assistance to health sciences teaching institutions seeking to realize the full potential of their audiovisual resources. Site visits by staff result in extensive surveys and subsequently, in collaboration with the requesting institutions, recommendations are made meeting specific needs of the institutions. The staff conducted surveys or site visits at the University of Alabama; West Virginia University Medical Center; Duke University, Physician Assistant's Program; Mississippi Regional Medical Program, (Jackson); Creighton University; University of Mississippi Health Science Center; Florida A & M University School of Pharmacy; University of Georgia, School of Veterinary Medicine; and Michigan State University. In addition, assistance in facilities planning was given 34 institutions including schools of medicine, dentistry, nursing, and allied health.

In a post-assessment survey at the University of Louisville, Health Science Center, Dr. Ernest Ellison, the Director of Biomedical Educational Resources, reported: "The nature of our organization and the pattern of its development is a direct reflection of the recommendations made by the site visit team from the National Medical Audiovisual Center."

Direct problem-oriented consultation services relating to educational technology and instructional media development were provided 115 representatives of 35 schools of medicine, 5 schools each of dentistry and nursing, 9 schools of allied health, 20 national or international agencies and professional societies, and 16 teaching hospitals.

A multi-media Learning Resource Center was established at the National Medical Audiovisual Center for demonstration purposes, and for use by visiting faculty and medical librarians. The Learning Resource Center has been used as a focal point for audiovisual media at the Center's workshops and other meetings.

Media Development

Most audiovisual design and development resources are being devoted to the support of major programs of the Center—training, applied research, and distribution. Additionally, many staff members with audiovisual production and education backgrounds are engaged in monitoring contracts for audiovisual development projects and services. Through a combination of contractual, in-house, and collaborative agreement efforts, 25 slide series, 22 motion pictures, 18 videotapes, 4 audiotape programs and 2 filmstrips were completed in FY 75.

The team approach was adhered to in all media development projects in which the Center was involved, including Project ACORDE (A Consortium On Restorative Dentistry Education). Seven cooperating institutions participate in Project ACORDE: the American Association of Dental Schools, the Division of Dentistry (Bureau of Health Manpower), Farwest Laboratory for Educational Research and Development, and schools of dentistry at the State University of New York (Buffalo), University of California (Los Angeles), and University of Florida. Fourteen short teaching films with accompanying instructor guides on the subject of restoration of cavity preparations were completed this year, and, additional units are now in production.

New Technology and Future Directions

Advances in educational technology during the last fifteen years have provided a solid base for transforming health sciences education and making it more responsive to the needs of students and practitioners. Underlying recent educational rationale is the concept that learning is a process that can be treated in a

systematic manner, by predesigning specific learning experiences for the acquisition of specific competencies. Inherent in this concept is the conviction that it should be geared to the attainment of performance capabilities by the learner, rather than the traditional "covering" of content by the teacher. There is also a growing emphasis on quality control and validated programs with insistence that instructional programs be tested and revised until they can be shown to work in repeated applications.

The incorporation of these principles into learning programs which make full use of the communication capabilities of modern media systems can promote significant changes in the training of health professionals. Some of the major characteristics and goals of this new approach are:

Health science careers will be considered unique, and the need for "customized" learning programs to make instruction more suitable for individual learning styles will be recognized

Learning centers will provide the spaces, media, materials, and other resources required to implement individualized programs

Students will have greater flexibility in scheduling their learning experiences, including the opportunity to begin professional studies before admission to a health sciences school

Accurate descriptions of criterion competencies will enable the student to check on his progress and measure his professional growth

As these goals are realized, it will become increasingly possible for students to assume responsibility for more of their own learning, both in undergraduate training and throughout their professional careers. These innovations in health sciences education will make new demands upon institutions and their faculties. They will also influence future program efforts of the Library's National Medical Audiovisual Center. Work areas that are currently underway and appear to hold particular significance include:

Determination of a highly effective and efficient model for the design of instruction

Creating model formats for the packaging of self-sufficient learning systems

Devising patterns of instructional management to enhance independent learning by large student groups

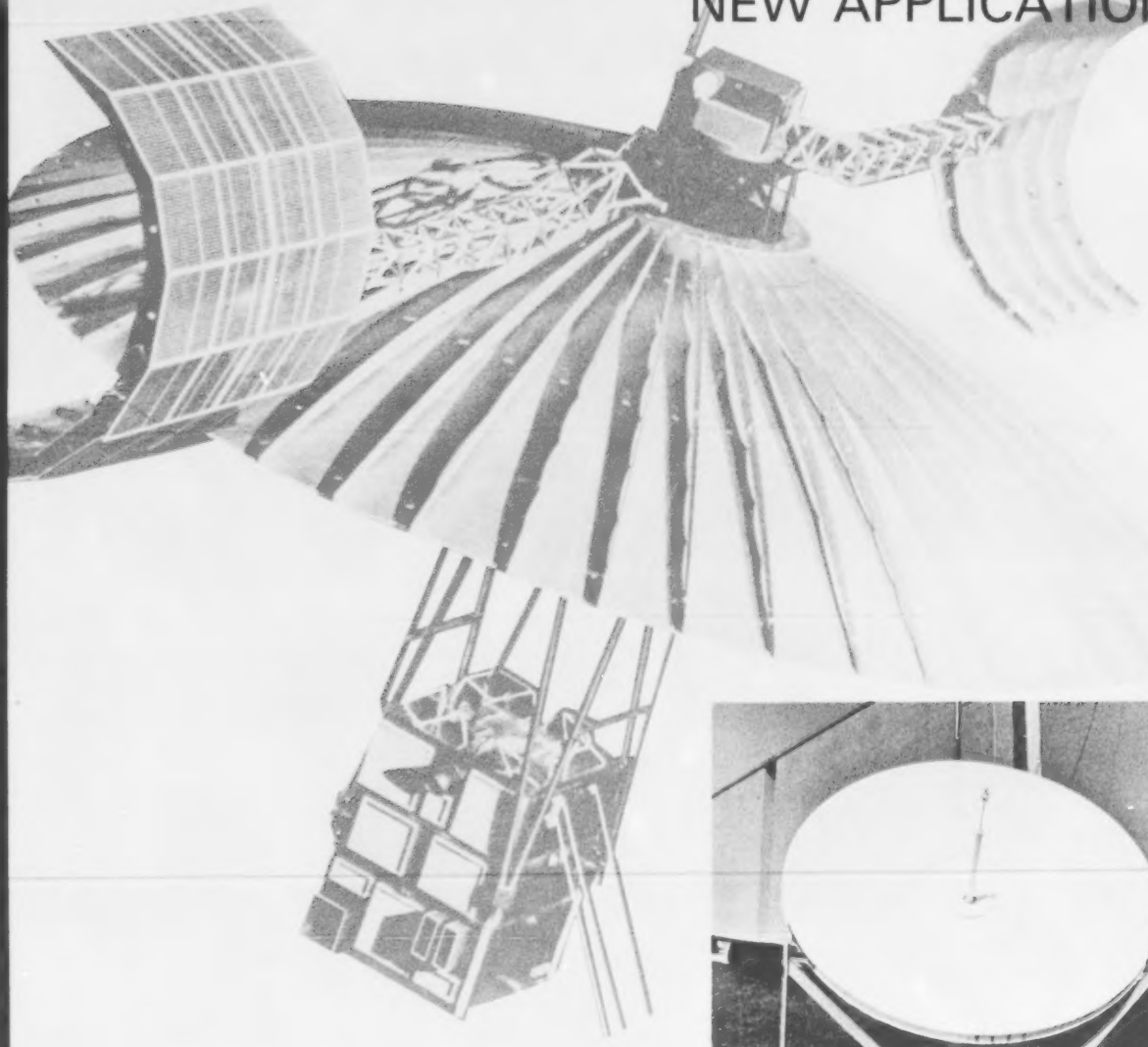
Identifying diffusion processes to facilitate exchange of audiovisual materials

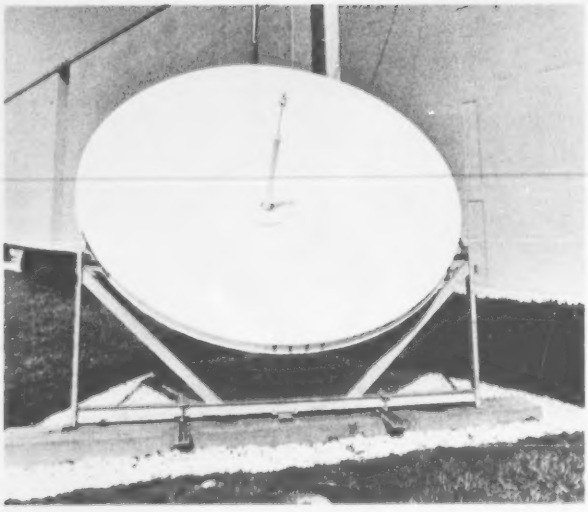
Continuing a national validation program to share in the review and exchange information on educational materials

Encouraging faculty development programs to enhance teacher knowledge of and commitment to the advantages of systematic instructional development

By providing research, development, training, and information in these areas, the Center seeks to play an important role in the improvement of health sciences education and thereby contribute to better health care for the nation.

CHAPTER IX NEW TECHNOLOGY, NEW APPLICATIONS—





Above: ATS-6 communications satellite
Right: Dish antennas used for video transmission via ATS-6.

INNOVATION IN HEALTH COMMUNICATION

Robert M. Bird, M.D., Director
Lister Hill National Center for Biomedical Communications

Public Law 90-456 established the Lister Hill National Center for Biomedical Communications in 1968 as an organizational component of the National Library of Medicine with two broad responsibilities. The first was research and development, demonstration, and evaluation of the applicability of advanced communications and computer technology to improved networks and information systems for the betterment of health education, medical research, and the delivery of health services. As a parallel and second responsibility, the Center was identified as a focal point within the Department of Health, Education, and Welfare for coordinating interagency efforts towards improving biomedical communications.

Solutions to major biomedical communication problems are sought by supplying technological competence and experimentally derived information to the design of new communication systems and networks. These activities can be classified in the following programmatic areas:

Broadband Biomedical Communications
Computer Based Education
Computer Technology Research and Development
Postgraduate Education for the Practicing Health Professional
Focal Point and Coordination Role, HEW

Broadband Biomedical Communications

Since July 1970 the Lister Hill Center has been working with Dartmouth College and the University of Vermont in planning, building, and helping to support the operations of the New Hampshire Vermont Medical Interactive Television Network known as INTERACT. The network is a dedicated, closed-circuit, two-way microwave television system which connects two academic health centers (Dartmouth-Hitchcock Medical Center and the Medical Center of Vermont) with three community hospitals (Claremont General Hospital,

Central Vermont Medical Center, and Rockingham Memorial Hospital), a community college (New Hampshire Vocational-Technical College), and a state prison (Vermont State Correctional Facility at Windsor). It spans approximately 180 air miles and share many of its transmission towers with the Vermont Educational Television System. A mobile van containing transmitters and receivers is used to connect the three smaller stations. The initial period of operation and construction of this network was devoted to exploring the uses and benefits of interactive television in a remote rural area. The past two years have tested the hypothesis that the programs can demonstrate cost benefits to the users to the point where the users will assume a substantial part of the costs of providing these services.

Interactive television helps practicing professionals obtain timely consultative services and postgraduate education which relates to immediate clinical problems. Certain medical services can be rendered over interactive television quite as well as with a direct physician/patient encounter. Consultation in dermatology is one example. Another is handicapped children who make good progress in speech therapy sessions even though the therapist is seen and heard only via the television set.

Achieving operational solvency has been a problem for the network. Dartmouth is increasing its efforts in this area and anticipates that the network will become self-supporting with the initiation of improved management practices and the assumption by all users of the prorated operational costs. Important lessons have been learned which apply to any future planning of interactive television networks for health. Interactive television projects should be justified from the start in terms of operational benefits. The operational products have to be clearly defined in terms of the needs of the user market. Management planning is as important as program planning if projects are to realize a cost effective end product.

Since 1972 the Lister Hill Center has worked with the Department of Community Medicine, Mount Sinai School of Medicine, New York City, to explore the potential of cable television for disseminating health information to an inner city geriatric population. The site of the project is the Gaylord White House, a 248-apartment, high rise public housing building in East Harlem. There are some 340 tenants whose average age is about 70. This is the final year for this project and the Lister Hill Center contemplates no additional funding for the operational support of the network.

Technically, the network has been successful. The tenants are very receptive to the programs and an increasing number have become involved in the production operations. Programs include demonstrations on hypertension, dental health, diabetes detection, mental health, and on vision. Videotape material in geriatric medicine is being developed for resident physicians. Efforts are underway with the state and city agencies to evolve a mechanism for continuing this cable television health link at the conclusion of the present project in August 1975.

Since 1971 the Center has been engaged in a series of experiments and demonstration projects which apply satellite communications technology to the solution of recognized problems in health education and the delivery of health services. Two satellites in the National Aeronautics and Space Administration's Application Technology Satellite (ATS) series have been involved, ATS-1 and ATS-6. ATS-1, launched in 1966, was designed for two-way voice and data transmission. The ATS-6 satellite was placed in orbit in 1974 and possesses sufficient power to provide quality television images using simple and relatively inexpensive ground terminals. (In May 1975, the ATS-6 satellite was repositioned to cover the Indian subcontinent.) The projects involving the combined use of ATS-1 and ATS-6 were (1) experiments with the Indian Health Service in establishing a Medical Consultative Network for remote areas in Alaska; and (2) experiments with the University of Washington in Regionalized Medical Education for the four-state region of Washington, Alaska, Montana, and Idaho (WAMI).

As a result of the experiments in Alaska, a coordinated telemedicine and health information system was developed. Community-based native health aides in small and inaccessible villages had audio/data/video communication links with physicians at the Service Unit Hospital in Tanana. Both groups had available to them medical specialists in Anchorage and Fairbanks for consultation. The primary purpose of this Medical Consultative Network was to enable physicians at Tanana to guide the village health aide in the proper diagnosis and treatment of village residents without the need for travel by the physician or the patient. The facilitation of consultative services by medical specialists was a secondary objective. Although video capability ended with the repositioning of the ATS-6, voice consultation is still being provided via ATS-1.

The Regionalized Medical Education project (WAMI) with the University of Washington applied an interactive audio data television network to the conduct of an educational program for medical students and resident physicians in remote areas. The sites of the WAMI project were in Seattle, Washington, at the University Medical Center; in Omak, Washington, at a family medicine clinic; and in Fairbanks, Alaska, at the University of Alaska. The link at Fairbanks tied the five sites of the Medical Consultative Network with the three sites of the WAMI experiment. The WAMI experimental program continues and has two objectives: (1) to increase enrollment opportunities for medical students in a four-state region without the need for increasing the number of medical schools; and (2) to structure undergraduate and graduate medical education so as to encourage students and resident physician graduates to locate in medically underserved areas.

Above: Physician at the Tanana Hospital presents an ailing infant to a specialist in Anchorage via satellite TV. Left: Communications specialist at the Alaska Native Medical Center (Anchorage).

This program permits the first academic year of medical school to be offered at a peripheral institution such as the University of Alaska. On completion, the student matriculates at the University of Washington School of Medicine for the three remaining years. Clinical clerkships conducted at community clinical training units are emphasized in the Seattle segment of the program. Resident physicians spend up to three months in these same community units.

Valuable lessons have been learned from these two major health experiments using satellite-based communications systems. The satellite system is highly reliable and avoids most of the interference which plagues conventional high-frequency radio communication in Alaska. It is possible to extend the services of a hospital-based physician to distant villages by the use of telemedicine conferences supported by a good medical record system. The village-based health aide feels more secure and less isolated; the patients are more confident of the quality of the services received; travel by patients and physicians can be reduced to that which is indicated medically; the community as a whole improves its understanding of health and the delivery system.

The WAMI Program demonstrates the possibilities inherent in regional sharing of people and facilities in the medical educational process. The interactive video, audio, and data communications network allows faculty and students located on multiple campuses and at remote clinical training locations to partake of one coordinated and integrated medical educational program.

Program planning for health experiments and demonstrations projects using the new Communications Technology Satellite (CTS) is the major current activity of the Communications Engineering Branch of the Lister Hill Center. This new satellite, a joint venture between the United States and Canada, will be launched in January 1976. Participation in the CTS Biomedical Communications Experiment is advantageous to the Lister Hill Center for two reasons. The experimental period will be relatively long. The CTS satellite has been designed to allow coast to coast communications.

The initial planning phase for the CTS Biomedical Communications Experiment can be divided into three areas of activity.

The first area is the coordination of program and evaluation planning, technical engineering support and program management for four health agencies—the National Institutes of Health, the Health Resources Administration, the Food and Drug Administration, and the Alcohol, Drug Abuse, and Mental Health Administration.

The second area of planning involves an expansion of the University of Washington's WAMI experiment. The scope is to design and specify all of the communications system requirements to ensure flexibility for expanded utilization. The University of Washington projects a greatly expanded network user population. The inclusion of postgraduate educational programs for practicing health professionals within the experiment in decentralized medical education opens an entirely new category of users and addresses a nationally recognized need.

The third area is physical facility planning. The goal is to provide the staff of the Lister Hill Center a laboratory in which to conduct their own experiments and demonstrations. Plans and specifications are being developed for a communications and broadcast facility within the National Library of Medicine. This facility, combined with a mobile van which is also in planning, will allow the Center to test projects in any area within the country.

Fort Yukon (Alaska) health clinic with dish antennas for ATS-6 satellite communication.

Computer Based Education

The current year is the terminal phase of a project which fostered the interinstitutional sharing of computer assisted instruction (CAI) resources among medical schools, hospitals, and other health related organizations. CAI programs produced at the Ohio State University College of Medicine and at the Massachusetts General Hospital were put on-line via a commercial nationwide timesharing communications network, TYMSHARE, Inc.

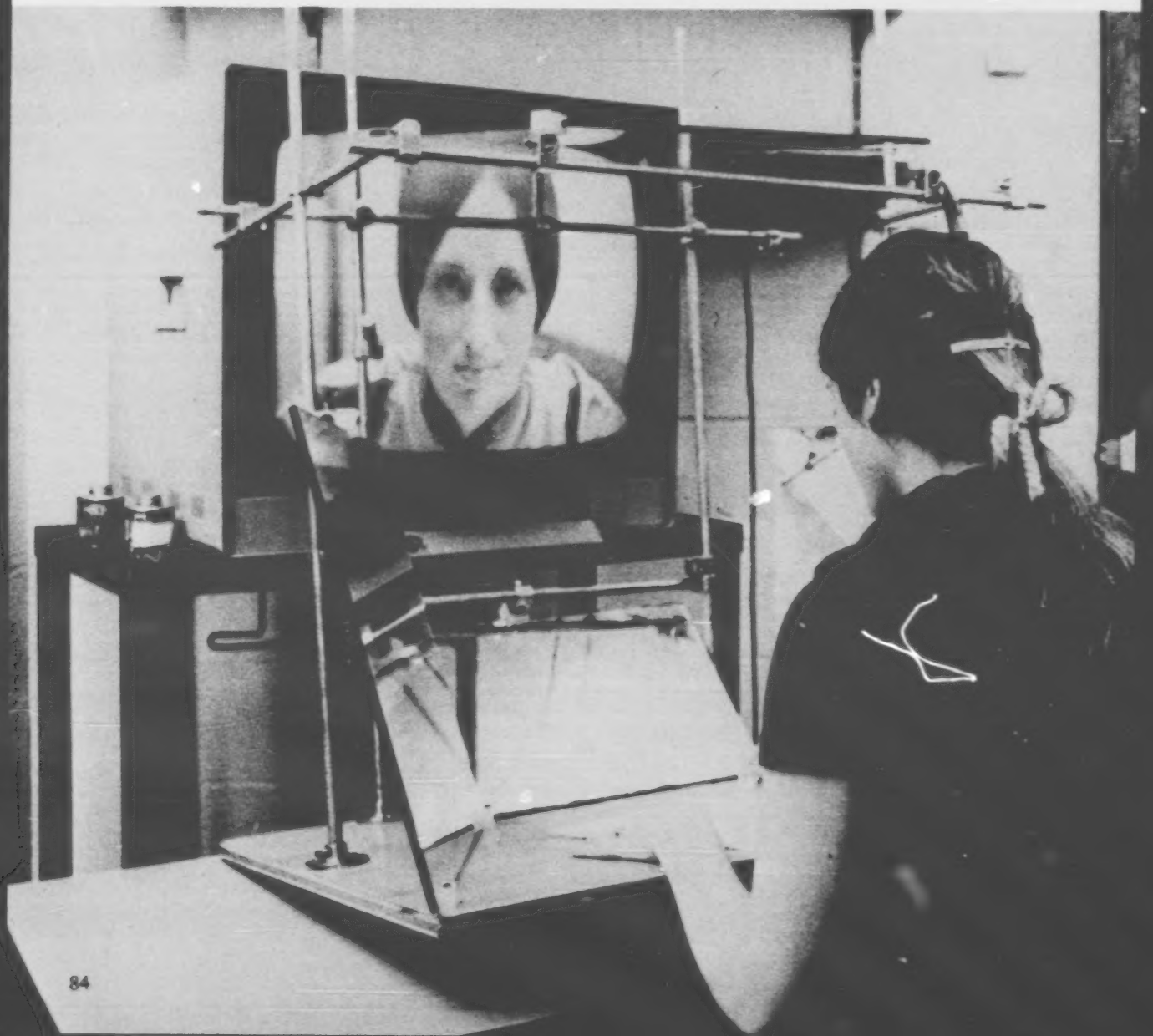
More than 80 medical schools have used the network for a variety of purposes, and new problem areas requiring further exploration have been identified. The operating cost of the network was large, however. A Health Educa-

84

tion Network User Group has developed a funding mechanism which will assure the self-sustained continuation of the network.

The CAI experimental network served to identify several factors inhibiting a more widespread incorporation of computer-based educational material into the core curricula of medical schools. The cost of large host computers, needed by many current CAI program offerings, can be a significant deterrent. Computer-based educational materials are written in many languages and dialects. There is a need for language standardization.

The needs of practicing health professionals for postgraduate education are great. Preservation of professional competence is one goal. To address this goal, the Computer Technology Branch of the Lister Hill Center is planning collaborative projects with the American Academy of Orthopedic Surgeons, the American Academy of Emergency Room Physicians, and the Department of Pediatrics of the Columbia Presbyterian Hospital of New York City. The objective underlying all of the current activities in CAI is to facilitate the ease of production and use and evaluation



of computer-based learning materials and thereby make the wider use of computer-based educational programs an attractive option.

Computer Technology Research and Development

A current activity with great promise is the development within the National Library of Medicine of a training laboratory designed to consolidate computer-based medical educational resources in a single area to provide:

- Centralized review of course material and comparison of modalities;
- Development of peer review techniques;
- Evaluation of various techniques for producing CAI materials;
- A learning resource for evaluation of programs by area physicians and students;
- A state-of-the-art equipment resources demonstration area;
- A focal point for research and development using minicomputers and microprocessors in support of various library and educational functions.

Three equipment items which will be placed in the training laboratory require further comment. The minicomputer will be evaluated in computer-based programs for education, in its application to library systems, and in the development of minicomputer systems. The desktop equipment item known as a "microprocessor laboratory" will be oriented towards research in tailored editing and file maintenance design, in code conversion, and in data communications. An interactive terminal will be installed to permit experiments involving multiple users.

Continuing Postgraduate Education for Physicians

The lifetime of learning which is expected of every competent medical practitioner represents in its aggregate a very large educational responsibility. There exists a vast array of educational opportunities having varied sponsorship and effectiveness. Despite all of these, there also exists a disturbing sense that current efforts in continuing postgraduate education are relatively ineffectual, inefficient, or of less than desirable quality or applicability. Is there a place where the Lister Hill Center can make a meaningful contribution? In what type of laboratory or clinical setting should experiments in postgraduate education be conducted? What experimental protocols are appropriate? Who should design the experiments? The answers to these questions are being sought and should give the Lister Hill Center priorities to be used in allocating its resources.

Four planning activities were directly related to the Center's concern for the development of more timely, more relevant, and more accessible postgraduate educational materials:

1. The Association for Hospital Medical Education was supported in a national survey of community hospitals and hospital consortia to determine the nature of the resources available for postgraduate educational programs. Four of these institutions, not associated with academic health centers, are being studied in depth. A knowledge of these community resources is essential to program design.
2. Collaborative planning is underway with the Health Services Administration and the Health Resources Administration to develop an information-consultation-education network for physicians in the National Health Service Corps. These Public Health Service physicians have just completed their residency training. Most are practicing in isolated rural areas lacking adequate health service resources. They appear to be an ideal group to study the problem of providing a communications network dedicated to the dissemination of information directly related to medical problems occurring in practices involving ambulatory patients. The question being asked is: Can such efforts improve the quality of the services delivered and at the same time reduce the sense of isolation which is experienced by many who serve in remote areas?
3. Administrative and management issues of great magnitude confront administrators in academic health centers. Accommodation to change and management of conflicting interests and priorities perplex those who head these institutions. The turnover rate of top administrators is rapid. Can the academic health community collectively learn from the experiences of its individual members? Can one develop a cadre of professionals who are prepared to attack the administrative and management problems which they will encounter on assuming any key administrative post? This represents a unique area of postgraduate education. The Lister Hill Center and the Association of American Medical Colleges are planning jointly to develop communication and information systems, together with operational models, to improve the managerial performance of top administration in our academic health centers.

Speech therapy session on the New Hampshire Vermont Medical Interactive Television Network (INTERACT).

4. In May 1975 the Lister Hill Center sponsored a two-day conference devoted to developing priorities in programs in continuing postgraduate education for practicing physicians. Ten consultants were invited from the fields of community practice, medical education, university administration, and organized medicine. Some of the questions which were asked included:

> What should be the objectives of postgraduate continuing education?
> What is the most effective way of transmitting knowledge, skills, and attitudes?
> What are the best ways to identify the subject matter needed by practitioners?
> Does the nature of the subject matter dictate the manner of delivery?
> What is the future for medical journals?
> Can one document educational goals which are fundamentally unique to the three phases of medical education: medical school, intern-resident, and continuing postgraduate?
> Who is responsible for educating the public in matters of preventive medicine and the various types of practice?

Focal Point Role for the Lister Hill Center

The "Statement of Organization and Functions and Delegations of Authority" for the Lister Hill Center defines the Center's role as a focal point in biomedical communications as follows:

> ". . . (5) represents DHEW in Federal activities related to biomedical communications activities; and (6) serves as the focal point in the Department for development and coordination of biomedical communications, systems and network projects."

Responding to the desires of the Telecommunications Policy Working Group of Health, an Ad Hoc Workshop on Telecommunications for Health was held at the National Library of Medicine in November 1974. The task of this workshop, with members representing the Department's six health agencies, was to formulate a policy statement for consideration by the Policy Group. The recommendation which was developed reads in part as follows:

> It was the consensus of the Workshop to recommend to the six agency heads and to the Assistant Secretary for Health that:
>
> 1. Agency heads assign an appropriate priority and commitment of staff to developing the potential of telecommunications systems application to health activities.
> 2. An interagency group be established for policy formulation and facilitation of telecommunication activities.
> 3. The Lister Hill National Center for Biomedical Communications of the National Library of Medicine be responsible for providing technical assistance and administrative support to the group.
> 4. The interagency group, working through and with the Lister Hill National Center for Biomedical Communications develop:
>   a. A mechanism to assure coordinated planning for telecommunications needs of health programs.
>   b. A means for encouraging active assessment of the potential use of telecommunications in the programs of H* and in the health programs of the private sector.
>   c. A means of assuring that the H agencies be kept informed of technical developments and contemplated political, administrative and legislative actions which may affect the agencies' access to and utilization of telecommunications systems.
>   d. A means of assuring that H agencies have an appropriate role in the decision-making process in DHEW regarding future developments in telecommunications.

The planning activities being coordinated by the Communications Engineering Branch of the Lister Hill Center for the Communications Technology Satellite are in direct response to the policies recommended by the Ad Hoc Workshop.

The Lister Hill Center has assumed an active coordinating and technical support role in planning a broadband communications utility for the Public Health Service. The planning objective is to develop for HEW's health agencies a mechanism for the coordinated planning of health programs involving the use of telecommunications, and

*That part of the Department represented by the "H" (Health) in HEW.

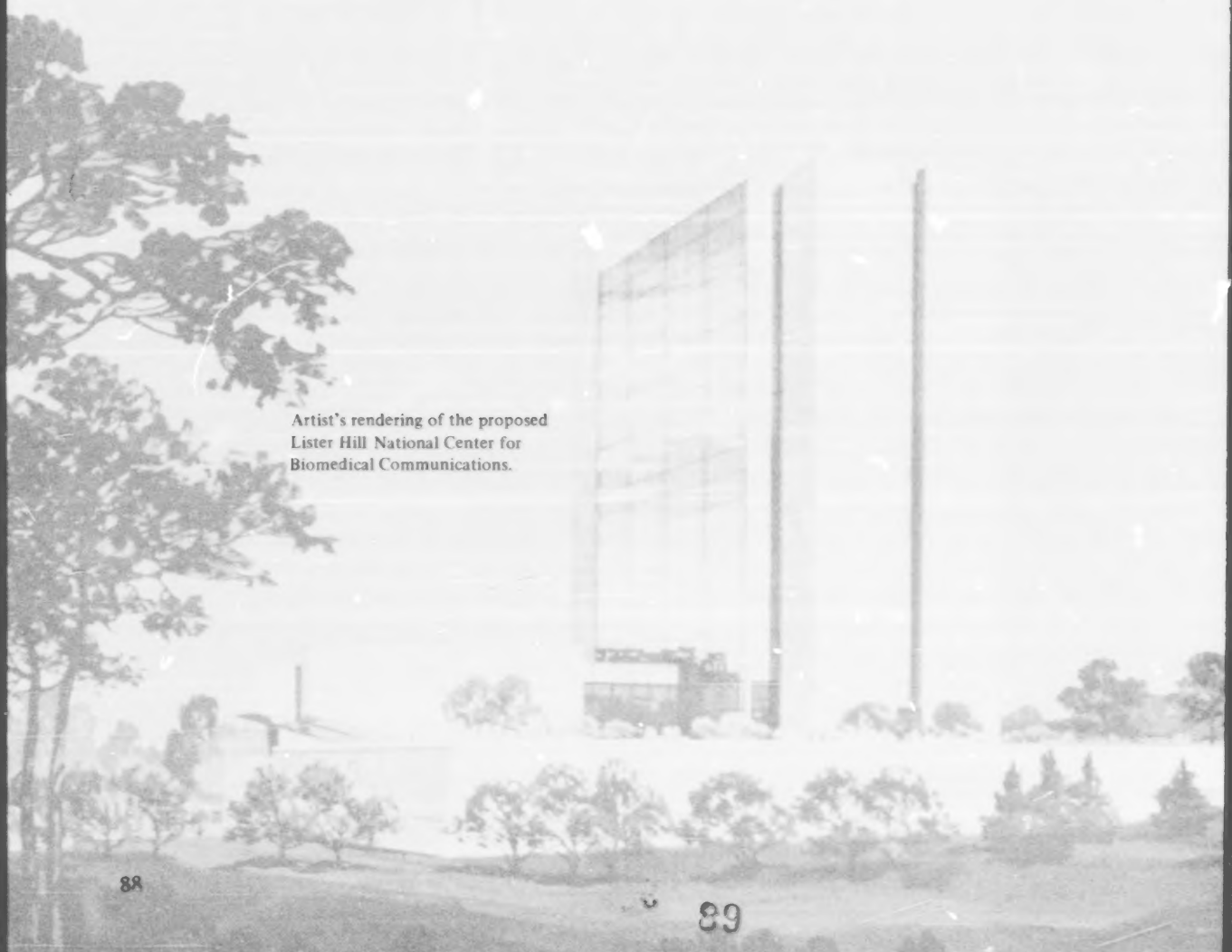
for evolving a National Broadband Biomedical Communications Utility. Major milestones in this effort will be:

- Development of a clearinghouse on technology relevant to health programs.
- Development of traffic and network models.
- Development of recommendations for National Broadband Biomedical Communications Network.
- Development of a coordinated plan for a Broadband Biomedical Communications Network responsive to the current and evolving needs of the health agencies.

The Department of Health, Education, and Welfare directed the Public Health Service to plan a consolidated PHS Data Communications Utility with a two-level structure. There is to be an executive steering committee of agency administrative officers and a planning task force of computer and communications specialists from each PHS agency. The task force developed an approach plan and recommended that the Lister Hill Center be the lead organization, with task force control over the planning effort. In-house and contract resources have been mobilized to support this planning activity.

The responsibilities inherent in serving as the focal point for biomedical communications for the health agencies places continuing demands on the professional and fiscal resources of the Lister Hill Center. Although the responsibilities are great, they serve as opportunities for making significant contributions to the health of the nation.

CHAPTER X ADMINISTERING A SPACE-AGE



Artist's rendering of the proposed Lister Hill National Center for Biomedical Communications.

COMMUNICATIONS RESOURCE

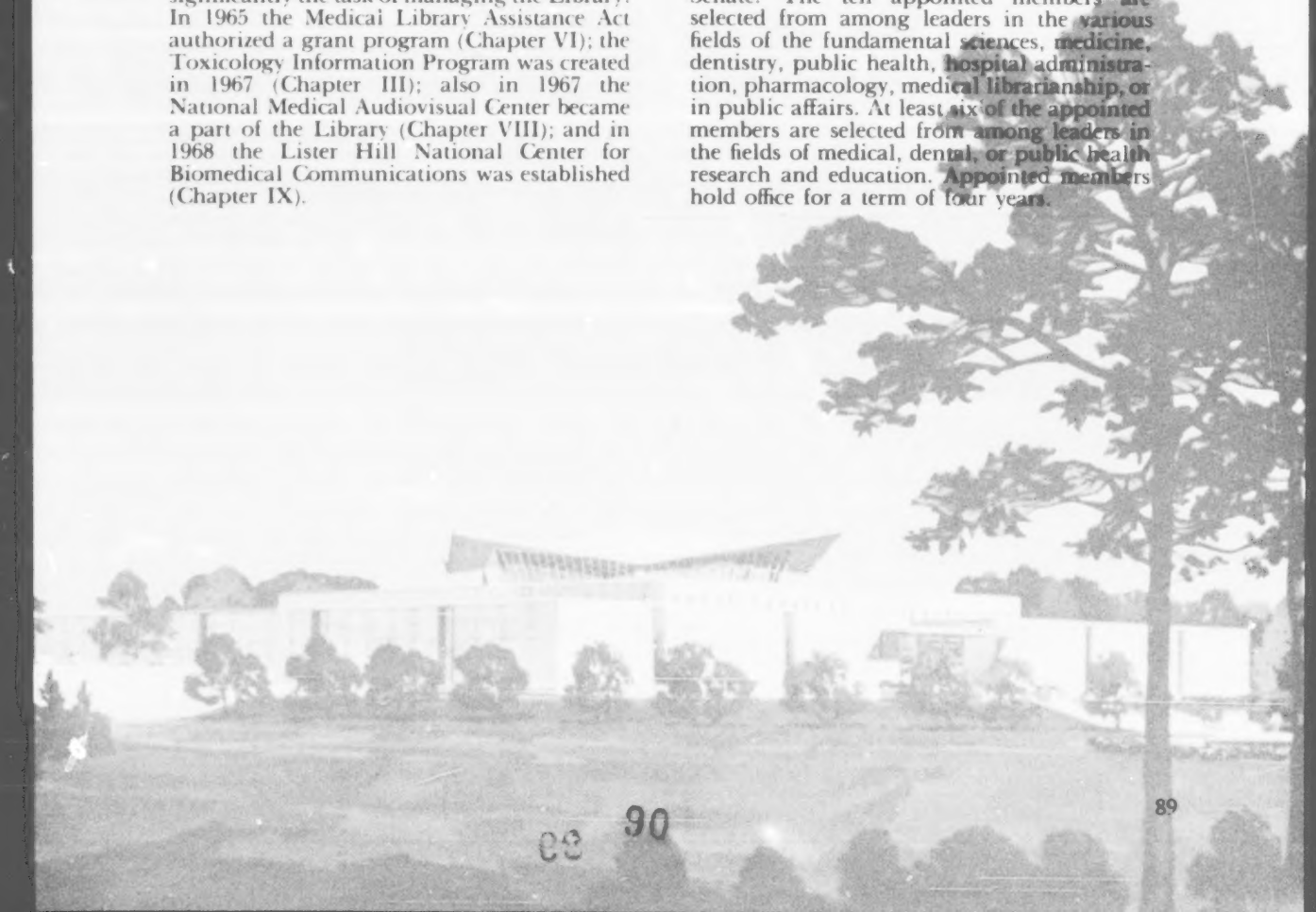
Kent Smith, Assistant Director, Administration

The steady increase in the scope of the Library's programs over almost a century and a half has been accompanied by increasingly complex administrative and management support services. Personnel, budget, and facilities (i.e., people, mor and space) have concerned the Library's administrators since the 1836 estimate of expenses for the Army Surgeon General's Office included an item of $150 for "Medical Books."

In the last decade a number of major new programs have come into being, increasing significantly the task of managing the Library. In 1965 the Medical Library Assistance Act authorized a grant program (Chapter VI); the Toxicology Information Program was created in 1967 (Chapter III); also in 1967 the National Medical Audiovisual Center became a part of the Library (Chapter VIII); and in 1968 the Lister Hill National Center for Biomedical Communications was established (Chapter IX).

Board of Regents

The National Library of Medicine's Board of Regents was established on August 3, 1956 by P.L. 941, 84th Congress. The Board consists of the Surgeons General of the Public Health Service, the Army, the Navy, and the Air Force; the Chief Medical Director of the Department of Medicine and Surgery, Veterans Administration; the Assistant Director for Biological and Medical Sciences of the National Science Foundation; and the Librarian of Congress, all of whom serve as *ex officio* members; and ten members appointed by the President, with the advice and consent of the Senate. The ten appointed members are selected from among leaders in the various fields of the fundamental sciences, medicine, dentistry, public health, hospital administration, pharmacology, medical librarianship, or in public affairs. At least six of the appointed members are selected from among leaders in the fields of medical, dental, or public health research and education. Appointed members hold office for a term of four years.



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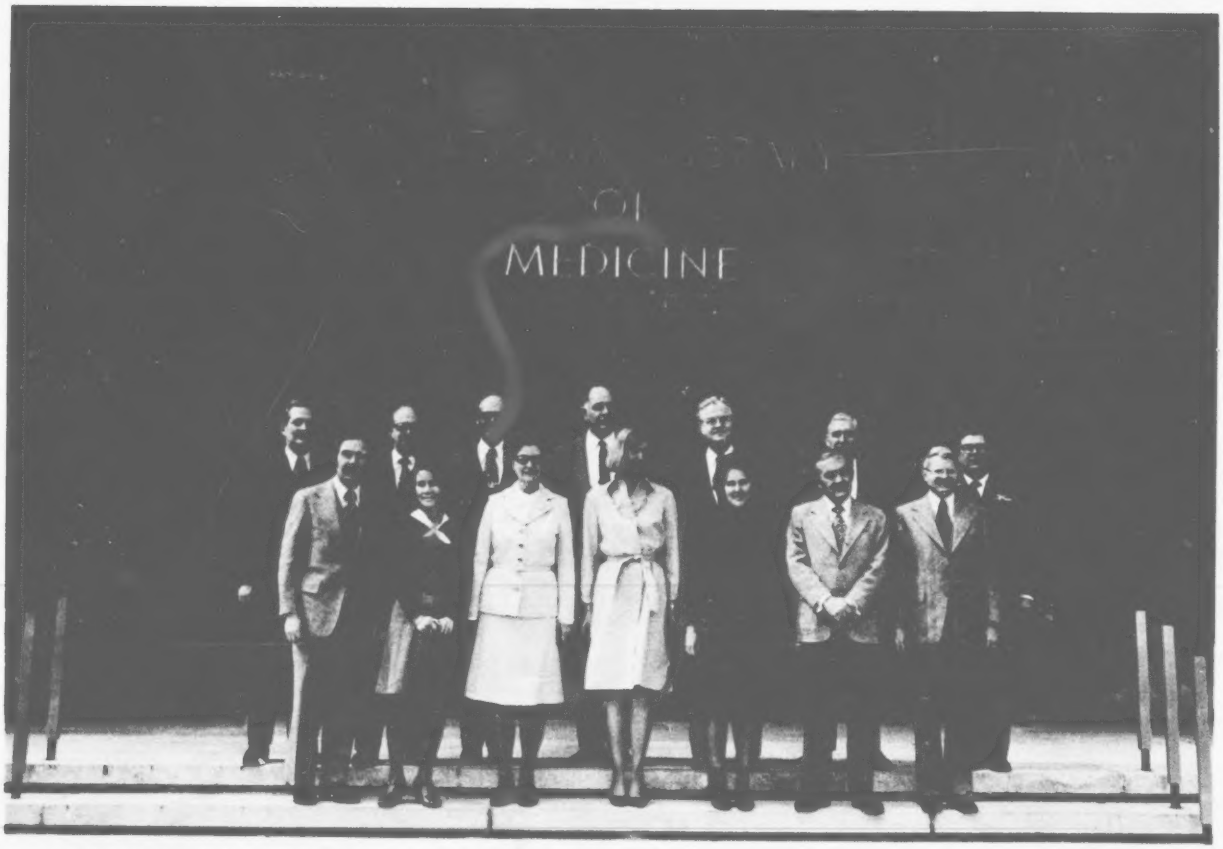

Board of Regents, June 1975: Top row, left to right: Capt. J. William Cox, Mr. John G. Lorenz, Dr. Martin M. Cummings (Executive Secretary), Dr. Angelo M. May, Dr. W. N. Hubbard, Jr. (Chairman), Dr. Joseph F. Volker, Col. Clifford R. Pollock; (bottom row, l. to r.): Dr. Richard R. Drisko, Dr. Susan Y. Crawford, Mrs. Bernice M. Hetzner, Dr. Eloise E. Clark, Dr. Ethel Weinberg, Vice Adm. Donald L. Custis, and Col. Mims C. Aultman. At the June meeting, Dr. Hubbard was re-elected chairman for the coming year. Retiring from the Board after four years of service were Dr. Crawford, Mrs. Hetzner, and Dr. May.

The Board of Regents advises, consults with, and makes recommendations to the HEW Secretary on all important matters of policy in regard to the Library, including such matters as the coverage of the Library's holdings; use of the Library's facilities; the scope, content, organization, nature and extent of the Library's services; and the rules under which its materials, publications, and services shall be made available.

Resolutions and actions of the Board of Regents have been concerned with matters as diverse as approving support of health libraries, and restrictions on expenditures under Resource Grant programs; on charges to users of on-line services, and preservation, maintenance, and availability of the Library's collection; on relocation of the National Medical Audiovisual Center and on peer review evaluation of media materials; on the formation of the national Biomedical Communications Network and the need for a national policy requiring coordination of information systems and data bases serving Federal executive agencies.

Financial Resources

In contrast to the 1836 "budget request" of $150, in January 1975 the President submitted to Congress the Administration's budget for fiscal year 1976 which included $28,815,000 for the Library. The increase over 1975 covers only mandatory costs for such items as salaries and benefits and does not provide for any expansion of NLM program activities. The President's budget also called for a reduction of seven positions.

TABLE 18. Amounts Obligated by NLM— FY 1972 - FY 1976*

*Amounts for 1976 are estimates

TABLE 19. Financial Resources and Allocations - Fiscal Year 1975

Amounts Available for Obligation	
Appropriation, NLM	$28,450,000
Plus: Unobligated Balance Brought Forward,	
Start of FY 1975	182,000
Pay cost supplement	400,000
Earned Reimbursements	1,298,000
Total	30,330,000
Amounts Obligated by Extramural Programs	6,687,000
Amounts Obligated for Direct Operations	
Lister Hill National Center for Biomedical Communications	2,234,000
National Medical Audiovisual Center	4,049,000
Office of Computer and Communications Services	4,233,000
Library Operations	6,219,000
Toxicology Information Program	1,881,000
Review and Approval of Grants	803,000
Program Direction	4,035,000
Subtotal, Direct Operations	23,454,000
Total Obligations, NLM	30,141,000

TABLE 20. Personnel Ceilings

	FY 1969	FY 1970	FY 1971	FY 1972	FY 1973	FY 1974	FY 1975
OFFICE OF THE DIRECTOR	14	12	13	12	12	11	9
OFFICE OF INQUIRIES AND PUBLICATIONS MANAGEMENT	7	6	6	5	6	5	5
OFFICE OF ADMINISTRATION	35	32	34	37	36	36	34
OFFICE OF COMPUTER AND COMMUNICATIONS SERVICES	55	57	58	55	54	51	52
EXTRAMURAL PROGRAMS	30	32	34	31	30	27	22
LISTER HILL NATIONAL CENTER FOR BIOMEDICAL COMMUNICATIONS	12	11	13	15	17	20	22
SPECIALIZED INFORMATION SERVICES	18	18	17	17	16	17	17
NATIONAL MEDICAL AUDIOVISUAL CENTER	122	109	104	105	103	100	101
LIBRARY OPERATIONS	196	198	188	192	192	199	196
TOTALS	489	475	467	469	466	466	458

In April 1975 subcommittees of both the House and Senate Appropriations Committees held hearings on the Library's request. Considerable interest was focused on the progress of the proposed Lister Hill Center building. Dr. Cummings informed both Committees that final architectural and engineering plans had been completed and that construction of this specialized facility could begin as soon as funds were appropriated. Both the House and Senate Appropriations Committees' Reports on the HEW appropriation bill issued in June 1975 called for the inclusion of $26 million for construction and expressed the belief that the Lister Hill Center building should not be further delayed.

The Library continued to experience the debilitating effects of inflation in 1975, particularly in the acquisition of serials and monographs. The Library also continues to encounter difficulties in meeting its service demands because of lower personnel levels.

Staffing

The Library has continued to operate within tight personnel restrictions. A personnel ceiling of 468 at the beginning of FY 1975 was reduced at mid-year by 10 positions. The actual number of employees as of June 30, 1975, included 340 assigned at the Library, 98 at the National Medical Audiovisual Center in Atlanta, and 25 in the Extramural Programs, in an off-campus government office building in Bethesda.

Robert M. Bird, M.D., was named Director of the Lister Hill National Center for Biomedical Communications in September 1974. Dr. Bird came to the Library from the University of Oklahoma School of Medicine where he had been a member of the faculty since 1952 and had served as Dean since 1970. He is the author of more than 50 articles and a member of numerous professional and scientific societies. Dr. Bird received the University of Oklahoma Regents Award for Superior

Teaching, and was Governor of the American College of Physicians in Oklahoma.

Ben Erdman, B.S., was appointed Deputy Director of the Lister Hill Center in March 1975. A former instructor in electrical engineering at Northeastern University, Mr. Erdman served more than ten years as a specialist in computer and communications systems with the Department of Defense prior to joining the Library staff.

Another addition to the Lister Hill Center staff was Charles M. Goldstein, B.S., M.S., who was appointed chief of the Computer Technology Branch in September 1974. A former Fulbright scholar who studied mathematics and physics in Germany, Mr. Goldstein served for 18 years with the National Aeronautics and Space Administration, most recently as chief of the Computerized Information Systems Office of the Lewis Research Center in Cleveland, Ohio.

R. Brian Makoff was appointed the Library's Personnel Officer in August 1974. Mr. Makoff formerly held personnel positions in the Environmental Protection Agency, the National Bureau of Standards, the Defense Mapping Agency, and the Agency for International Development. He was president of the Montgomery County Chapter of the International Personnel Management Association in 1973-1974.

Clifford A. Bachrach, M.D., was selected to head the Medical Subject Headings Section in the Office of the Associate Director for Library Operations. Dr. Bachrach had been chief of the Bibliographic Services Division. His former deputy, William H. Caldwell, was promoted to the position of Chief of the Division.

Richard T. West was selected to become chief of the Office of Program Planning and Evaluation of the Extramural Programs. Mr. West had served as a Program Officer in the Extramural Programs since 1970.

Awards and Honors

The Venezuelan Academy of Physical, Mathematical, and Natural Sciences in late 1974 elected Director Martin M. Cummings, M.D., and Melvin S. Day, Deputy Director, to be Honorary Corresponding Members. The Venezuelan Academy is the oldest such group in the Western Hemisphere. Dr. Cummings and Mr. Day were honored for their pioneering work in the field of information technology and, in the words of the Academy: "Their contributions have changed the course of science communication."

Mr. Day also received the annual Director's Award at the June 1975 meeting of the Board of Regents. In presenting the award, Dr. Cummings cited Mr. Day's highly effective leadership and management during his past 2½ years as Deputy Director. "He has represented NLM at the highest levels of policy and technical conferences with great dignity and distinction."

In October 1974, Mr Day was installed as president-elect of the American Society for Information Science. After he becomes president in October 1975, Mr. Day will preside at all business meetings of the Society and will also serve as chairman of its Council.

Harold M. Schoolman, M.D., Assistant Deputy Director, received an HEW Superior Service Honor Award for his "notable contribution to the planning, development, coordination, and evaluation of the NLM programs." Dr. Schoolman also received the Alumnus of the Year Award for Service to Government from the Medical Alumni Association of the University of Illinois.

John Cox, Chief, General Applications Branch, Office of Computer and Communications Systems, received the Sixth Annual Regents Award for Scholarship or Technical Achievement. Mr. Cox was cited for his "exceptional technical and managerial contributions to the development and implementation of MEDLARS II."

Lister Hill Center Building

Several factors have led to the realization that the Library must expand its physical plant. The most significant of these was the recognition that the Library must become more than a traditional medical library; it should become a comprehensive national center for biomedical communications. The legislative basis for this expanded role is found in the Joint Resolution of Congress (PL 90-456), signed by President Johnson on August 3, 1968, which established the Lister Hill National Center for Biomedical Communications. Specifically, this resolution called for ". . . a National Center for Biomedical Communications to be constructed and located as part of this Library . . ."

Three other events which occurred prior to the formal establishment of the Lister Hill Center also increased pressure for physical expansion. The Medical Library Assistance Act of 1965 created a grants and contracts program within the Library to assist the nation in meeting the need for adequate medical library services and facilities. Space

for the staff required to administer this program is currently provided in off-site offices. A Toxicology Information Program was established in 1961. Staff for this program currently occupy space originally designated as stack area. The Public Health Service Audiovisual Facility, then a part of the Communicable Disease Center in Atlanta, was transferred to the Library in 1967 and was redesignated the National Medical Audiovisual Center. Though closely tied programmatically with other areas of the Library, especially the Lister Hill Center, the Center remained physically located in Atlanta.

This program growth was not foreseen during planning for the present Library facility, which was occupied in 1962. The problem of providing space for the expanding collection has been compounded as a result of converting 25,000 square feet of space originally designated as stack area to office space. The present facility, designed to accommodate a staff of 250, now houses about 340 employees. They have been accommodated only by seriously overcrowding available work space.

Congress has been in the forefront both in recognizing the need for the new Lister Hill Center facility and in expressing strong support for its construction. The Senate Appropriations Committee's formal reports on HEW appropriation bills for 1973 and 1974 stated very forcefully its position regarding construction of this much needed facility. In the 1973 report the Committee expressed disappointment "that funds available in FY 1970 for architectural and engineering studies . . . have not yet been obligated by the Department" and further stated that the need for this facility was "imperative." In the 1974 report the Committee stated "that adequate space may become an acute problem because of the rapidly growing field of biomedical literature." House of Representatives support has been equally strong. The House Appropriations Committee's Report on HEW's appropriation bill for FY 1974 stated, " . . . space available in the present building may soon be inadequate. Architectural plans are underway and it is expected these plans will be completed in time before the space problem becomes acute."

John Cox (right) receives Regents' award from W. N. Hubbard, Jr., M.D., Chairman, (left) and NLM Director Cummings.

Planning money for the architectural and engineering design efforts was requested and appropriated in FY 1970, but not released by the Office of Management and Budget until January 1972. An architectural and engineering contract was awarded in November 1972 and final working drawings are now complete. When construction funds are appropriated bids for the actual construction contract can be solicited immediately.

The Lister Hill Center will be constructed adjacent to the present Library and will contain 200,000 gross square feet. It will rise ten stories above grade; three levels will be below grade and will form a podium-type base for the ten story tower. The Center will contain offices, conference rooms, an auditorium, biomedical communications laboratories, exhibit areas, computer and communication facilities, audiovisual production rooms, and necessary service facilities. Current construction cost is estimated at $23,000,000.

The new building would house staff of the Lister Hill Center, the National Medical Audiovisual Center, the Extramural Programs, the Specialized Information Services Program, the Office of Computer and Communications Systems, and a small portion of Library Operations.

Copyright

Seven years almost to the day after the Williams & Wilkins Company filed a petition against the Federal Government alleging copyright infringement, the U.S. Supreme Court announced that it would not overturn a lower court decision in favor of the Government. The final ruling was announced on February 25, 1975. The Justices were split four to four on the question, but by their deadlock they affirmed a 1973 U.S. Court of Claims decision that photocopying by the National Library of Medicine and the National Institutes of Health Library of copyrighted journal articles for interlibrary loan is not a copyright violation.

The lengthy legal proceedings started on February 27, 1968, when Williams & Wilkins, a medical publishing firm in Baltimore, filed a suit charging that the Library and NIH, by providing health professionals with single photocopies of journal articles, had infringed the publisher's copyright. The Government argued that such copying for interlibrary loan was within the definition of "fair use," and that such reproduction was necessary to insure the dissemination of published research results.

On February 16, 1972, Commissioner James F. Davis of the U.S. Court of Claims, where the case was first argued, filed a report to that Court in which he held in favor of the plaintiff. Government attorneys filed an exception to the report and, on November 27, 1973, by a vote of four to three, the full Court of Claims found in favor of the Government. That decision was appealed to the U.S. Supreme Court by Williams & Wilkins. Among the organizations filing briefs with the courts on behalf of the Library were the American Library Association, National Education Association, Association of Research Libraries, Special Libraries Association, Medical Library Association, American Association of Law Libraries, American Medical Association, American Dental Association, Mayo Foundation, University of Michigan Medical School, University of Rochester Schools of Medicine and Dentistry, American Sociological Association, Modern Language Association, History of Medicine Society, and Robert H. Ebert, M.D., (in his capacity as Dean of the Faculty of Medicine, Harvard University). Although much of the activity to date relating to copyright stems from the court action, we believe that the issue must ultimately be settled by Congress, where legislation for the general revision of the copyright law is pending.

Exhibits

The Library put three exhibits on display in its lobby in FY 1975. The first two, comprised of material from the History of Medicine collection, were on "Medicine of World War I" and "The Hopkins Four." The latter exhibit displayed material relating to the careers of four famous U.S. physicians associated with the Johns Hopkins School of Medicine: William Osler, William S. Halsted, William H. Welch, and Howard A. Kelly. The third exhibit, entitled "The Physician as Artist," was a collection of paintings and drawings by a prominent uropathologist, Meyer M. Melicow, M.D.

Equal Employment Opportunity Activities*

After the Library's EEO Conference at Harper's Ferry in March 1971, the position of EEO Coordinator was established and two Affirmative Action Plans were developed. The Bethesda plan was completed in August 1972 and the Atlanta plan in February 1974.

Vital to the Library's EEO program is open communication between employees and management. The situation at the Library has

*by Arthur Robinson, EEO Coordinator

been enhanced by the establishment of an EEO Committee. Employees are encouraged to bring their concerns to the elected representatives who form the Committee. At present, the Committee is reviewing the EEO program's effectiveness in each of the program areas, and the involvement of minority staff in professional meetings.

In the area of promotions, with 28 percent of the workforce minority employees, minority promotions have gone from 27 percent of the total promotions in 1970 to a high of 60 percent in 1973, a positive influence of the 1971 conference. In FY 1975 a drop to 42 percent occurred. It is expected that, as former inequities are corrected, the number of minority employees promoted will come into line with their proportional share of the Library's workforce. Promotions for women, who represent 51 percent of the workforce, have gone from 56 percent of the total promotions in 1970 to 70 percent in 1973 (again, a positive result of the conference), to 57 percent in 1975. Here, a leveling off is also expected.

Progress has been made in minority hiring due in part to an increase in EEO awareness among Library supervisors and staff. Recent hirings of EEO significance include two librarians, two administrative officers, one engineer (all minority members), two female computer operators, and a male secretary. Several of these positions have been in the higher grades.

Some positions were created as a result of job engineering and restructuring which provided greater responsibility and opportunity for minority employees. Among these were an administrative trainee position established in 1972 in the Office of Administration, and an in-house training program for five library technicians interested in qualifying as librarians. In addition, attempts are being made to attract more minority librarians into the highly competitive Library Associate Training Program.

The Library participates in the various HEW Upward Mobility Programs. These include: Project Stride—a program combining college courses and on-the-job training for nonprofessionals; Project Access—a cooperative work-study program involving alternating periods of full-time work and full-time college attendance; and Upward Mobility College—a college degree and precollege preparatory program on the campus of the National Institutes of Health. The Library has three students enrolled in Project Stride, one in Project Access, and 23 in the Upward Mobility College. Four Library employees have received college degrees through the Upward Mobility College.

An annual EEO awards ceremony was instituted in 1972 to recognize employees who have demonstrated outstanding accomplishments in fostering equal employment opportunity objectives. During this ceremony the Director presents highlights of the Library's EEO program and announces his support of recommendations he feels will assist the Library to reach its EEO objectives. In 1974 the National Institutes of Health EEO Award was presented to Rita Orr, Personnel Specialist at the Library.

Appendix 1. Staff Bibliography

The following articles and other works were published by National Library of Medicine authors in FY 1975:

Aines, A.A. and Day, M.S.: National planning. In Cuadra, C.A. (Ed.): *Annual Review of Information Science and Technology*. Washington, D.C., American Society for Information Science, 1975, Vol. 10.

Blake, J.B.: The anatomical lectures of William Shippen, 1766. *Transactions and Studies of the College of Physicians of Philadelphia*. 42:61-66, July 1974.

Blake, J.B.: The compleat housewife. *Bulletin of the History of Medicine*. 49: 30-42, Spring 1975.

Blake, J.B.: Health reform. In Gaustad, E.S. (Ed.): *The Rise of Adventism: Religion and Society in Mid-nineteenth-century America*. New York, Harper & Row, 1975, pp. 30-49.

Calhoun, E.G.: Information sources. In Lieberman, E.J. (Ed.): *Mental Health: The Public Health Challenge*. Washington, D.C., American Public Health Association, 1975, pp. 261-269.

Cassedy, J.H.: Early uses of acupuncture in the United States. *Bulletin of the New York Academy of Medicine*. 50: 892-906, 1974.

Cassedy, J.H.: Medicine and the rise of statistics. In Debus, A.G. (Ed.): *Medicine in Seventeenth Century England*. Symposium held at UCLA in Honor of C.D. O'Malley. Berkeley, University of California Press, 1974, pp. 283-312.

Cassedy, J.H.: The roots of American sanitary reform 1843-47: seven letters from John H. Griscom to Lemuel Shattuck. *Journal of the History of Medicine*. 30: 136-147, April 1975.

Corning, M.E.: Effect of copyright on dissemination of information. In *Proceedings of the General Assembly Meeting*, International Council of Scientific Unions Abstracting Board (ICSU AB), Berlin, Germany, July 1974, pp. 203-214.

Corning, M.E.: National Library of Medicine: international cooperation for biomedical communications. *Bulletin of the Medical Library Association*. 63(1): 14-22, 1973.

Cosmides, G.J.: Human variability—and safer, more effective pharmacotherapy. *Orthopaedic Review*. 3(8): 7-12, 1974.

Cummings, M.M.: A comment on William B. Bean's medical writing. *Archives of Internal Medicine*. 134(11): 834-835, 1974.

Gluckstein, F.P.: Diseases of public health significance. In Weisbroth, S.H., Flatt, R.E., and Kraus, A.L. (Eds.): *The Biology of the Laboratory Rabbit*. New York Academic Press, 1974, pp. 453-462.

Humphrey, S.M.: Searching the MEDLARS citation file on-line using ELHILL 2 and STAIRS: a comparison. *Information Storage and Retrieval*. 10: 321-329, 1974.

Kissman, H.M. and Oxman, M.A.: *The Toxicology Data Bank*. United Nations Environment Programme, Expert Workshop on an International Register of Potentially Toxic Chemicals, Bilthoven, The Netherlands, January 6-11, 1975.

Krivatsy, P.: Paracelsus in Basel: the time of change. In *Proceedings of the XXIII International Congress of the History of Medicine, London, 2-9 September 1972*. London, Wellcome Institute of the History of Medicine, 1974, vol. 2, pp. 1106-1110.

Lee, M.O., Lee, D.C., Kim, S., and Clifford, D.H.: Cardiovascular effects of acupuncture at Tsu San Li (St-36) in dogs. *Journal of Surgical Research*. 18:51-63, 1975.

McCarn, D.B.: Trends in information. In Zunde, P. (Ed.): *Information Utilities: Proceedings of the ASIS Annual Meeting*. Washington, D.C., ASIS, 1974, vol. 11, pp. 145-150.

Olch, P.D.: The Halsted society, 1924-1974. *The Johns Hopkins Medical Journal*. 135: 33-41, 1974.

Olch, P.D.: William S. Halsted and local anesthesia: contributions and complications. *Anesthesiology*. 42: 479-486, 1975.

Schoolman, H.M.: The future: libraries, librarians, and users. *Library Trends*. July 1974, pp. 165-175.

Waserman, M.J.: Two early case reports. *Journal of the History of Medicine.* 30: 165-167, April 1975.

Wooster, H.: *Eheu fugaces*—not quite posthumously. *Bulletin of the American Society for Information Science (ASIS).* 1: 9, 31-32, 1974.

Wooster, H.: Marking and parking—a sexist fable. *Journal of Documentation.* 30: 224-227, 1974.

Wooster, H. and Lewis, J.F.: The utility of computer assisted instruction—an experimental network. In Zune, P. (Ed.): *Information Utilities: Proceedings of the ASIS Annual Meeting.* Washington, D.C., ASIS, 1974, vol. 11, pp. 213-217.

Appendix 2. P.L. 480 Supported Publications

Fiscal Year 1975

Arnon, Ruth, "Immunochemistry of Enzymes," *The Antigens,* Volume 1. New York, New York: Academic Press, 1973, pp. 87-159.

Heinroth, Johann Christian. *Textbook of Disturbances on Mental Life or Disturbances of the Soul and Their Treatment,* Volume 1 - Theory. Translated by J. Schmorak, Jerusalem, Israel Program for Scientific Translations. Baltimore, Maryland: The Johns Hopkins University Press, 1975. 229 pp.

Kohn, Alexander, and Fuchs, Pinhas, "Initial Effects of Viral Infection in Bacterial and Animal Host Cells," *Advances in Virus Research,* Volume 18, New York, New York: Academic Press, c 1973. pp. 159-194.

Laufer, A. "Human and Experimental Myocarditis," *Israel Journal of Medical Sciences,* Volume 11, Number 1, January 1975. pp. 37-66.

Leibowitz, J.O. and Marcus, S. (eds.) *Moses Maimonides on the Causes of Symptoms,* Berkeley, California: University of California Press. 1974. 263 pp.

Maslinski, Czeslaw (ed.) *Histamine.* Stroudsburg, Pennsylvania: Dowden, Hutchinson & Ross, Inc. 1973. 363 pp.

Rabinowitz, David, and Roth, Jesse. (eds.). "Heterogeneity of Polypeptide Hormones," *Israel Journal of Medical Sciences.* Volume 10, No. 10, October 1974. pp. 1183-1363.

Samueloff, Shlomo. "Metabolic Aspects of Desert Adaptation (Man)," *Advances in Metabolic Disorders,* Volume 7, 1974, pp. 95-138.

Sandbank, U. and Bubis, J.J. *The Development of Synapses; a Review of the Embryological Development of Synapses in the Central Nervous System.* Los Angeles, California: Brain Information Service, Brain Research Institute, University of California, 1974. 39 pp.

Sandbank U. and Bubis, J.J. *The Morphology of Motor Endplates.* Los Angeles, California: Brain Information Service, Brain Research Institute, University of California, 1974. 72 pp.

_____. *The Pathology of Synapses.* Los Angeles, California: Brain Information Service, Brain Research Institute, University of California, 1974. 49 pp.

Rachmilewitz, Eliezar, A. "Denaturation of the Normal and Abnormal Hemoglobin Molecule," *Seminars in Hematology,* Volume 11, Number 4, 1974. pp. 441-462.

Shoshan, Shmuel, and Gross, Jerome. "Biosynthesis and Metabolism of Collagen and Its Role in Tissue Repair Processes," *Israel Journal of Medical Sciences,* Volume 10, Number 5, May 1974. pp. 463-576.

Trainin, N. "Thymic Hormones and the Immune Response," *Physiological Review,* Volume 54, Number 2, April 1974. pp. 272-315.

Weiss, David W. (ed.). "Immunological Parameters of Host-Tumor Relationships III," *Israel Journal of Medical Sciences,* Volume 10, Number 8, August 1974, pp. 815-1074.

Zahorski, Witold W. (ed.). *Coal Workers' Pneumoconiosis: A Critical Review.* Hanover, New Hampshire: The University Press of New England, 1974. 108 pp.